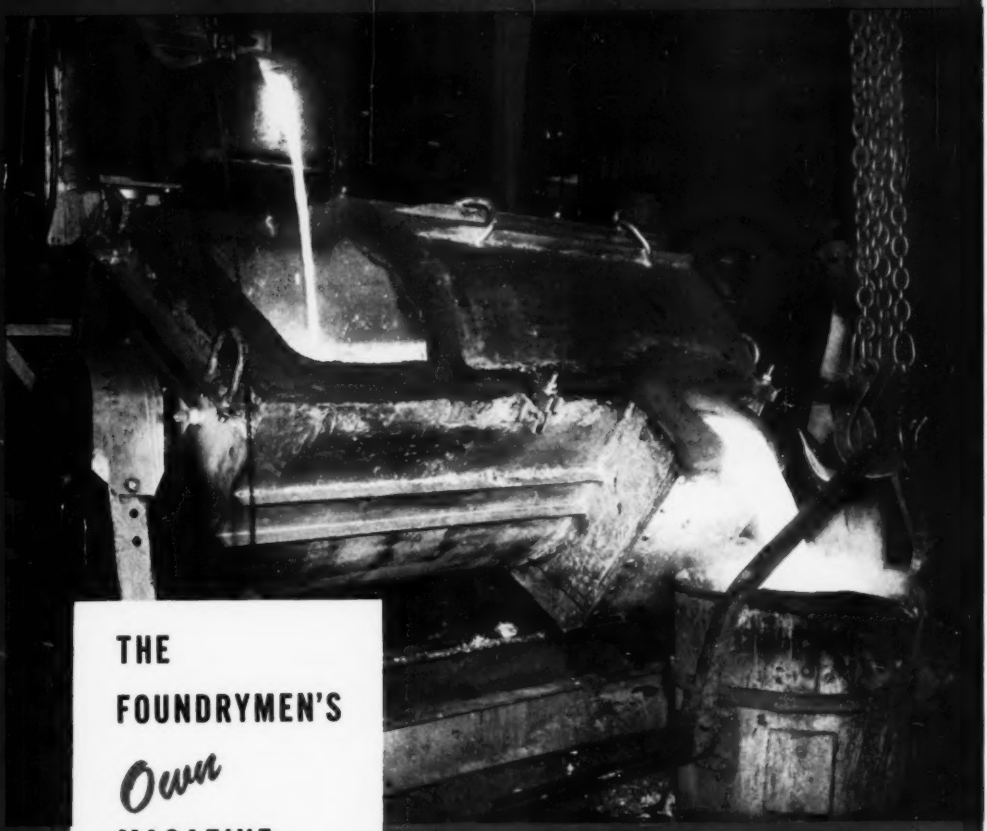
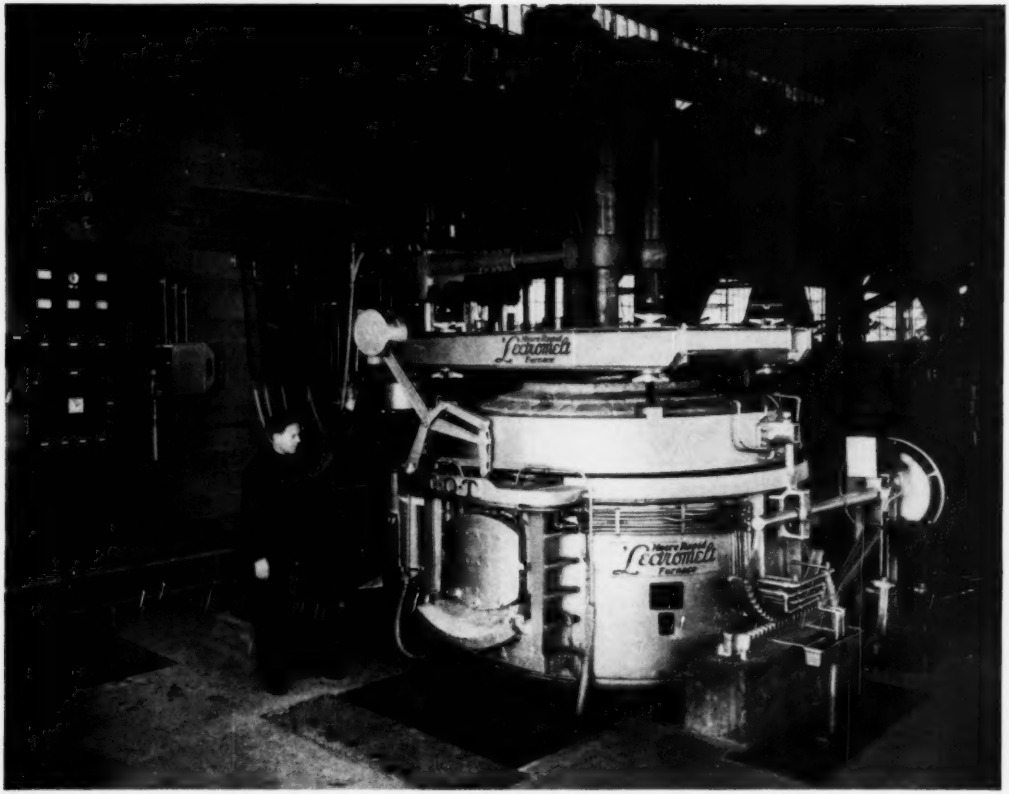
JUNE
1949

American Foundryman



THE
FOUNDRYMEN'S
Own
MAGAZINE



Ideal for Melting the New Nodular Ductile Irons

Lectromelt Furnaces, like the size CQT pictured above, provide the close control of analysis and temperature required for successful utilization of the new nodular ductile irons. These furnaces readily reduce the sulphur and phosphorous content to the low limits needed to obtain the highest physical properties.

* * * *

Lectromelt Forehearth Furnaces are being used in increasing numbers for control and adjustment of the analysis and temperature of metal melted in other equipment. They are especially designed for operation in conjunction with existing cupolas or air furnaces.

Write today for detailed information of Lectromelt's complete range of Forehearth and regular melting furnaces.

PITTSBURGH LECTROMELT FURNACE CORPORATION
PITTSBURGH 30, PENNSYLVANIA

MOORE RAPID
Lectromelt
FURNACES

manufactured in: CANADA, Lectromelt Furnaces of Canada, Ltd., Toronto 2; ENGLAND, Birlec, Ltd., Birmingham; SWEDEN, Birlec Elektkougnar A B, Stockholm; AUSTRALIA, Birlec Ltd., Sydney; FRANCE, Stein et Roubaix, Paris; BELGIUM, S. A. Belge Stein et Roubaix, Bressoux-Liege; SPAIN, General Electrica Espanola, Bilbao; ITALY, Forni Stein, Genoa.

A *Helping Hand*

for Foundrymen Everywhere

● Foundrymen everywhere choose Crown Hill Seacoal Facing. Here's why: Crown Hill cuts cleaning costs, produces a smoother finish and eliminates hard spots.

Made from high volatile, quick-flash coal, Crown Hill vents rapidly. Low sulphur content eliminates hard spots. Because of the high fusion point of its small ash content, molten iron cannot fuse to it.

Put Crown Hill Seacoal Facing to the test in your own foundry (like so many others have) and see the difference.

Made by the Long-Time Friend of the Foundries

FIGURES FROM BUREAU OF MINES DEPT. OF INTERIOR OF THE U. S.
(Moisture Free)

PROXIMATE ANALYSIS	
Volatile Matter (V.C.M.)	38.9%
Fixed Carbon	57.4%
Ash	3.7%
	100.0%

ULTIMATE ANALYSIS	
Hydrogen	5.4%
Carbon	82.0%
Nitrogen	1.8%
Oxygen	6.8%
Sulphur	.7%
Ash	3.7%
	100.0%
Fusion Point of Ash	2,980° F.

- *It vents the mold quickly*
- *Eliminates hard spots*
- *Cuts cleaning costs*

THE FEDERAL FOUNDRY SUPPLY COMPANY

4600 East 71st Street · Cleveland 5, Ohio

Branch Plants
CROWN HILL, W. VA. · CHICAGO · CHATTANOOGA, TENN. · DETROIT · MILWAUKEE · NEW YORK · ST. LOUIS · RICHMOND, VA. · UPTON, WYO.

IN TWIN CITIES: The Foundry Supply Co., Inc., 404 South Third St., Minneapolis 15, Minn.

Trademarks of Distinction

THESE and many other leading manufacturers in the motor field protect their products with Tousey Casting Sealer. Tousey originated the manufacture of casting sealer to rigid specifications. Copies of these specifications, revised over the years to meet current needs, are available on request.

TOUSEY VARNISH CO., 520 W. 25th Street, Chicago 16, Ill.

TOUSEY PRODUCTS
CASTING SEALER

A. F. S.
NATIONAL OFFICERS

PRESIDENT
*W. B. Wallis
Pittsburgh Lectromelt Furnace Corp.
Pittsburgh, Pa.

VICE-PRESIDENT
*E. W. Horlebein
Gibson & Kirk Co.
Baltimore, Md.

NATIONAL DIRECTORS

Term Expires 1949

H. A. Deane
Brake Shoe & Castings Div.
American Brake Shoe Co.
New York

J. E. Kolb
Caterpillar Tractor Co.
Peoria, Ill.

*Max Kuniansky
Lynchburg Foundry Co.
Lynchburg, Va.

H. G. Lamker
Wright Aeronautical Corp.
Wood Ridge, N. J.

B. L. Simpson
National Engineering Co.
Chicago

*S. C. Wasson
National Malleable & Steel Castings Co.
Chicago

Term Expires 1950

E. N. Delahunt
Warden King, Ltd.
Montreal, Quebec, Canada

W. J. MacNeill
Dayton Malleable Iron Co.
Dayton, Ohio

F. C. Riecks
Ford Motor Co.
Dearborn, Mich.

*J. M. Robb, Jr.
Hickman, Williams & Co.
Philadelphia

A. C. Ziebell
Universal Foundry Co.
Oshkosh, Wis.

Term Expires 1951

T. H. Benners, Jr.
T. H. Benners & Co.
Birmingham, Ala.

N. J. Dunbeck
Eastern Clay Products, Inc.
Jackson, Ohio

Robert Gregg
Reliance Regulator Corp.
Alhambra, Calif.

A. M. Fulton
Northern Malleable Iron Co.
St. Paul, Minn.

*V. E. Zang
Unitcast Corp.
Toledo, Ohio

*Member Executive Committee

PUBLICATIONS COMMITTEE

H. M. St. John, *Chairman*
Crane Co.
Chicago

C. H. Lorig
Battelle Memorial Institute
Columbus, Ohio

W. D. McMillan
International Harvester Co.
Chicago

H. J. Rowe
Aluminum Company of America
Pittsburgh

F. J. Walls
International Nickel Co.
Detroit

A.F.S. HEADQUARTERS
222 WEST ADAMS ST., CHICAGO 6

Wm. W. Maloney, *Secretary-Treasurer*
S. C. Massari, *Technical Director*
Jos. E. Foster, *Technical*
A. A. Hilbron, *Convention & Exhibits*
H. F. Scobie, *Editor*
R. N. Sheets, *Assistant Editor*
C. R. McNeill, *Editorial*
John D. Murray, *Advertising*
Terry Koeller, *Promotion*

CONTENTS

Salute to A.F.S. Committees: T. H. Benners, Jr.	23
Report to the A.F.S. Membership	24
Cleveland Selected for the 54th A.F.S. Foundry Congress and Show	26
53rd A.F.S. Convention News Story: Part II	28
Radioisotope Gage Indicates Liquid Metal Height in Cupola: D. C. McCutcheon	35
Modern Foundry Methods: H. G. Sieggreen	40
Foundry Exhibit Highlights Navy Pier Illini Open House: Charles Fausel	43
Friction Saw Cuts Castings Cleaning Cost: H. J. Chamberland	44
Convert Ladle Dimensions to Iron Weight: H. L. Campbell	48
Cast Figure Process Reduces Machining Costs: George Krumlauf	50
Collecting, Organizing, Analyzing Foundry Data: W. K. Bock	53
Properties of Refractory Materials: S. M. Phelps	58
More Chapter Apprentice Contest Winners	60
Products Parade	61
The Round Table	65
Who's Who	67
Letters to the Editor	68
New A.F.S. Members	69
Chapter Meetings	70
Chapter Officers and Directors	71
Foundry Personalities	72
A.F.S. Chapter Directory	73
Chapter Activities News	74
Foundry Literature	80
Foundry Firm Facts	82
Advertisers' Index	84

AMERICAN FOUNDRYMAN is indexed regularly by Engineering Index, Inc.

VOLUME XV, NUMBER 6

American Foundryman

June, 1949

Official publication of American Foundrymen's Society

The American Foundrymen's Society is not responsible for statements or opinions advanced by authors of papers printed in its publication.

This Month's Cover

Originally hung in an exhibit sponsored by the Minnesota Professional Photographers' Association, the cover picture was made by H. Larson, H. Larson Photographic Studio, Minneapolis, in the Lake Street plant of Minneapolis-Moline Co. Engaged to photograph fathers and sons employed in the plant, the photographer was intrigued by the molten metal and made the picture. The 7000 lb capacity mixing ladle assures uniform metal composition during the 18 hr continuous tap. An electrical control system keeps a minimum of 2000 lb of molten iron in the mixer at all times.

Published monthly by the American Foundryman's Society, Inc., 222 W. Adams St., Chicago 6. Subscription price in United States, Canada and Mexico, $3.00 per year; international, $6.00. Single copies, 50c. Entered as second class matter July 22, 1938, under Act of March 3, 1879, at the Post Office, Chicago, Illinois.

QUALITY IS CONTROLLED

in Globe's Silvery Pig, too

STARTING as originators of silvery pig, Globe now makes hundreds of different grades of silvery to meet customers' needs and specifications. Every step is carefully controlled to assure that each shipment has complete uniformity of physical and chemical properties.

As our silvery pig is put through the basic steps of burdening (where proper amounts of raw materials are blended) on to pigging, cooling and loading—all operations and all raw materials such as ore, coal, coke and limestone are carefully checked. This assures top quality iron at minimum cost.

Our plant is now running at full capacity and a full expansion program is under way. So we hope deliveries of all grades of silvery pig soon can be made to all customers without delay. If you need help in any casting problem, our metallurgical staff stands ready to help.

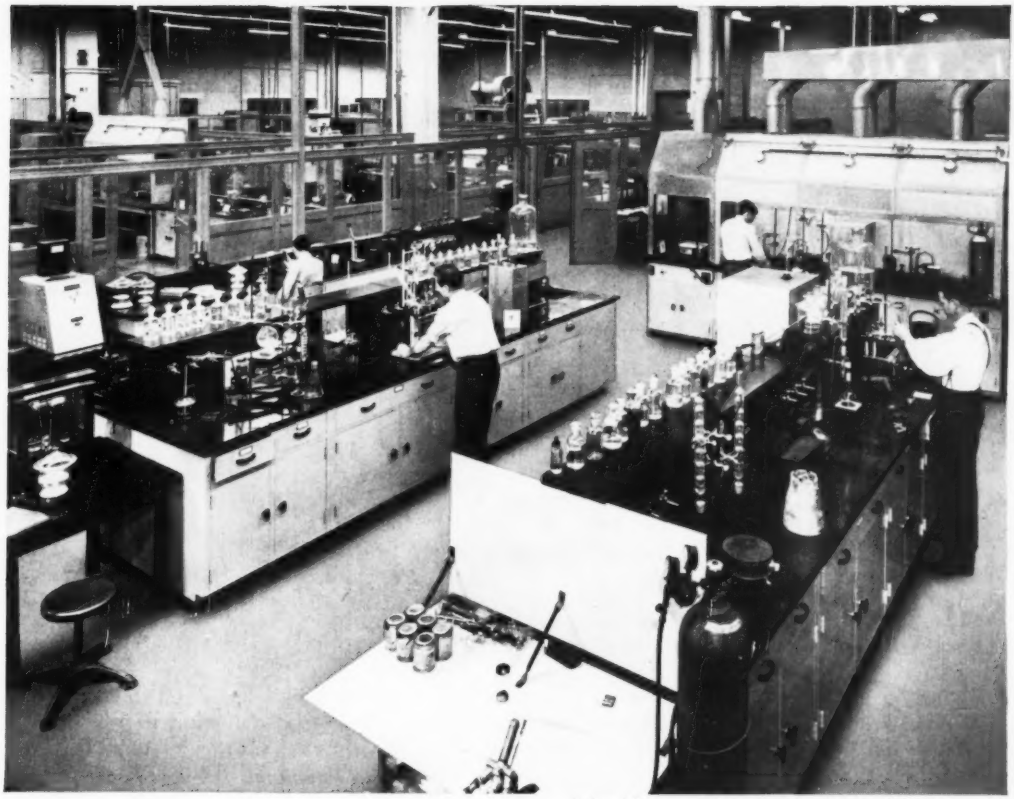
Quality is metallurgically controlled, from our mine to you.

GLOBE
Since 1872
SILVERY PIG

GLOBE IRON CO.

BLAST-FURNACE SILVERY PIG IRON • BESSEMER GRADES OF SILVERY, SPECIAL, ALLOY, HIGH-SILICON PIG IRONS FOR PARTICULAR APPLICATION

JACKSON, OHIO



Making laboratory analyses of grinding wheels and abrasive materials

This is your grinding wheel laboratory

This is just one corner in the immense research and development laboratories of United States Rubber Company at Fort Wayne, Indiana.

Here "U. S." Abrasive Engineers work to lower your grinding wheel costs. They delve into every phase of bonds and abrasives, developing wheels that are more economical for snagging castings.

Their development work has revealed 5,000,000 possible combinations of size and construction. This means that they can produce the exact wheels you need for your conditions.

Take advantage of the "U. S." grinding wheel service. Write Grinding Wheel Dept., United States Rubber Company, Fort Wayne 4, Indiana.

NEW . . . IMPROVED PARTING

DELTA PARTEX
NUT SHELL PARTING

FOR

Faster Production

OF FINER-FINISH CASTINGS

DELTA PARTEX is a superfine, waterproofed powder made from selected nut shells. It contains no harmful or hazardous ingredients. It is safe, easy and economical to use. It flows like water, dusts freely through the shaker bag and covers all surfaces uniformly.

DELTA PARTEX has the properties and characteristics of lycopodium at only a fraction of the cost.

DELTA PARTEX works faster, saves time and lasts longer. Core boxes and patterns stay cleaner with fewer applications.

DELTA PARTEX has a uniform surface affinity for sand. It will not pile up in corners. It is non-reactive with molten metal and will not pit nor etch metal patterns or core boxes. It will not contaminate or change the characteristics of core and molding sands.

Ask for a liberal working sample for test purposes and prove to yourself the advantages of DELTA PARTEX in your foundry.

9 IMPORTANT REASONS WHY DELTA PARTEX IS MORE EFFICIENT AND MORE ECONOMICAL TO USE . . .

1. No silicosis hazard.
2. Has the properties and characteristics of lycopodium.
3. Is non-reactive with molten metal.
4. Will not pit nor etch metal patterns and core boxes.
5. Will not contaminate nor reduce fusion point of core and molding sands.

6. Has uniform surface affinity for sand.
7. Leaves casting surfaces clean and free from contamination for plating work.
8. Is free-dusting through shaker bag.
9. Is moisture-resisting and will not deteriorate on aging.

DELTA OIL PRODUCTS CO.

MILWAUKEE 9, WISCONSIN

SOLID *Castings!*

Famous Cornell Flux
Improves Cupola
Operation, too!
It keeps cupolas cleaner and by forming a glazed or vitrified surface over and above the melting zone it prolongs life of brick and prevents "arching over" to a great extent. Drops are cleaner. Maintenance time and cost is surprisingly little.

Stronger, denser grained castings, great reduction of hard spots, hollow centers, chilled sides, and easier machining—that's what you gain by cleansing your molten iron with—

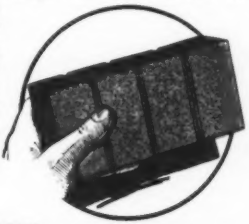
Famous CORNELL CUPOLA FLUX

It makes metal hotter and freer flowing and there is a very *noticeable reduction of sulphur.*

The best evidence of its value to the industry is our list of leading foundries who have used it regularly for years.

FAMOUS CORNELL CUPOLA FLUX IN SCORED BRICK FORM, makes cleansing of metal a faster, easier, more accurate and low cost operation. No digging out of container. No weighing. No measuring. No waste.

SIMPLE TO USE. You toss Famous Cornell Flux into cupola with each ton charge of iron, or break off one to three briquettes (quarter sections) for smaller charges. Being in solid (not powder) form, this flux does not blow out with the blast but stays in melting zone until entirely consumed, insuring full efficiency.



• **MALLEABLE FOUNDRIES,** with cupola operation, are showing a rapid trend towards the use of Famous Cornell Cupola Flux. Reports of greatly improved casting production come from every direction. Furthermore, there is a considerable reduction in cupola maintenance labor and cost. The life of cupola lining, whether brick or stone, is greatly prolonged.

Write for Bulletin 46-B

The **CLEVELAND FLUX** *Company*

1026-1034 MAIN AVENUE, N.W., CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes — Since 1918

FAMOUS FLUXES Trade Mark Registered

Write for Bulletins ➡

Famous CORNELL ALUMINUM FLUX

Produces clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections are poured. Castings take a higher polish. NO FUMES! Exclusive formula prevents obnoxious gases. Metal does not cling to dross.

Famous CORNELL BRASS FLUX

Makes metal pure and clean, even when dirtiest brass turnings or sweepings are used. Produces castings which withstand high pressure tests and take a beautiful finish. Saves considerable tin and other expensive metals. Crucible and furnace linings are preserved.

Famous CORNELL LADLE FLUX

Place a few ounces in bottom of ladle, then tap cupola. Metal is thoroughly cleansed, foreign impurities are easily skimmed off. Ladles are kept clean, there is less patching and increased ladle life. Metal temperatures are retained during transfer to molds.

Two Model 70 Speedmullors—and two Sandslingers, a Stationary Type and a Motive Jr. Type—*all* were part of a reorganization program to mechanize Olney Foundry of Link-Belt Company.

Both Speedmullors are automatically controlled for time cycles of $1\frac{1}{4}$ to $1\frac{1}{2}$ minutes per batch—including loading, additions, mulling, cooling and discharging. They *thoroughly* mull and cool over 700 tons of sand per day, and "thoroughly" is the word for it because Olney is exacting in its sand specifications.

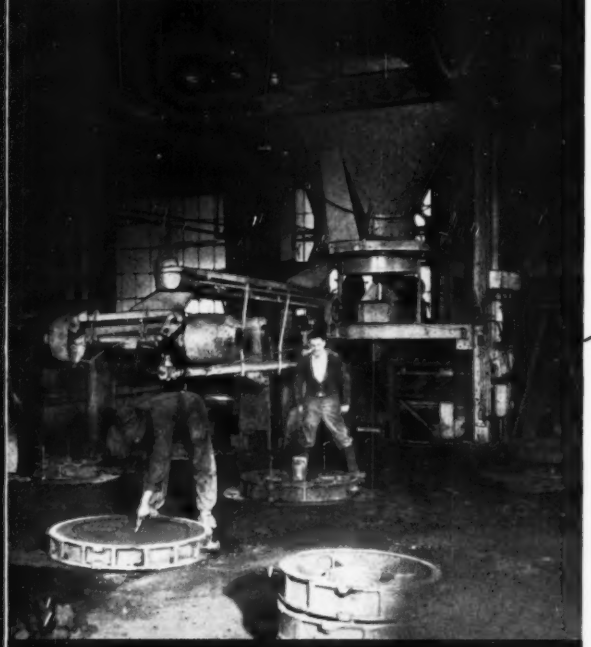
Olney's Stationary Type Sandslinger rapidly and uniformly rams a wide variety of sprocket molds from 30" to 54" in diameter. Their Motive Jr. Sandslinger quickly rams medium and large floor and pit molds.

A B&P representative will make arrangements for you to see these Speedmullors and Sandslingers in operation. Write today!

PROFITABLY USES

SANDSLINGERS
SPEEDMULLORS

a



b

c

BEARDSLEY & PIPER

DIVISION OF PETTIBONE MULLIKEN CORPORATION

General Offices: 2424 North Cicero Avenue, Plant: 2541 North Keeler Avenue

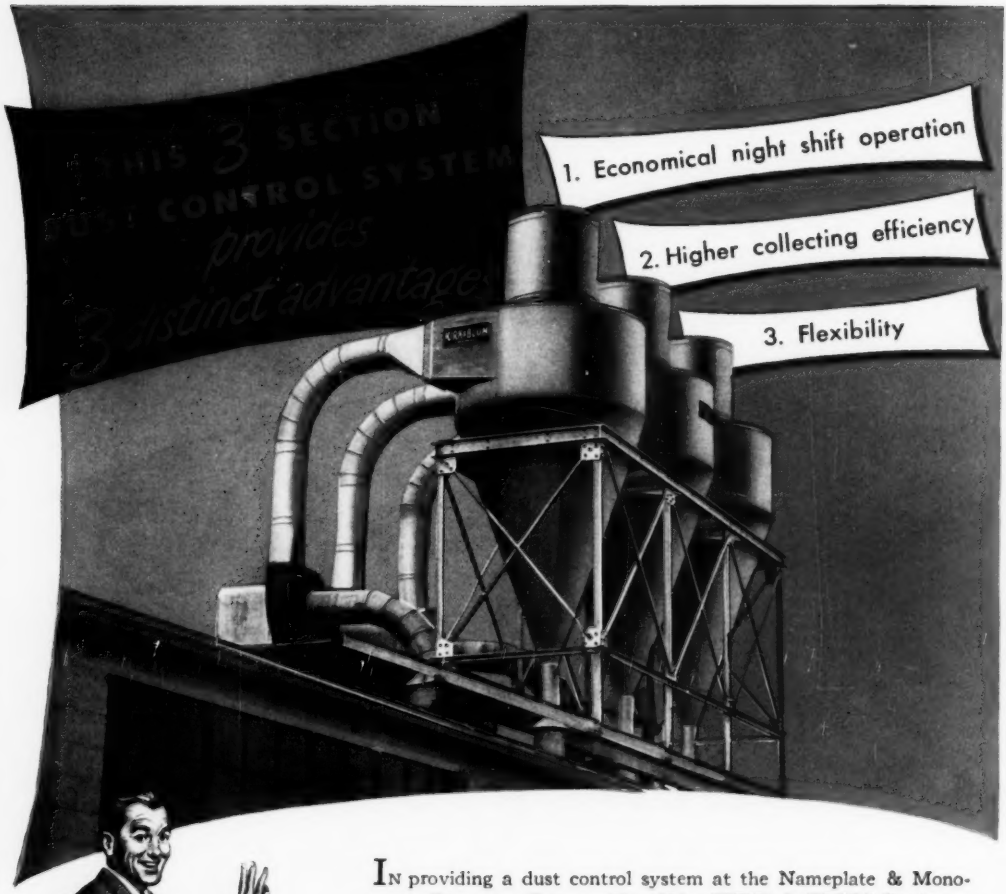
CHICAGO 39, ILLINOIS

Beardsley & Piper are manufacturers of the Sandslinger • Speedslinger • Hydra-Slinger • Speedmullor • Mulbara • Screenarator • Junior Nite-Gang Preparator • Champion Speed-Draw • Plate Feeders • Turntables • Gyratory Screens

a Completely thorough mulling and cooling of 700 tons of sand per day in 1½ minute cycles—that is the performance of the two Model 70 Speedmullors at Olney.

b Ramming with a Stationary Type Sandslinger pays off on heavy sprocket molds of widely varying size.

c The Motive Jr. Sandslinger proves its versatility in ramming various sized floor and pit molds. It does the job in minutes compared to hours required by hand ramming.



This installation in the buffing and polishing department of this well-known nameplate manufacturer illustrates the way in which KIRK & BLUM engineers are able to design, fabricate and install the equipment to meet your individual requirements.

IN providing a dust control system at the Nameplate & Monogram Company, Spencerville, Ohio, KIRK & BLUM Engineers designed a 3-system arrangement to accommodate special conditions within this particular plant. The results obtained in actual operation suggest that similar systems would be advantageous in many plants.

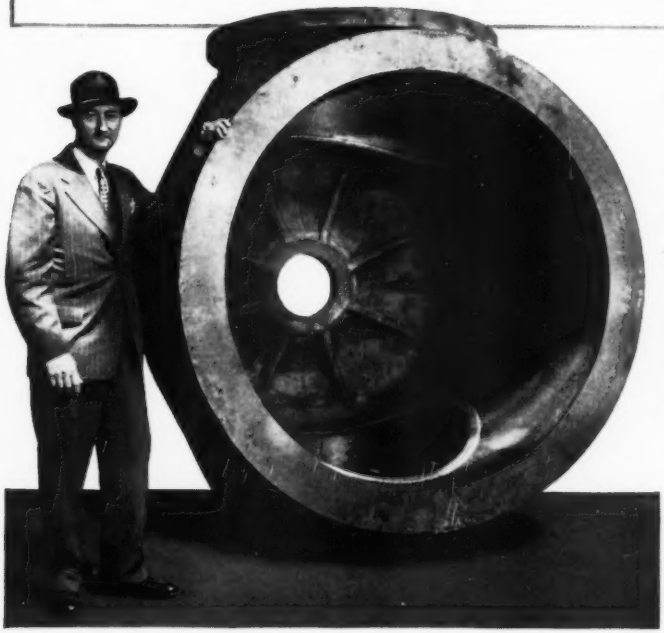
Dust control for 36 buffing and polishing machines was divided between the three systems. One of the systems serves the machines used on the night shift alone . . . thus avoiding the excessive cost of operating the complete system. In addition, multiple collectors provide higher collecting efficiency . . . the relocation of one line would not curtail the operation of the other two.

IF YOU are contemplating a new, enlarged or improved dust control system, write for free booklet, "Dust Collecting Systems in Metal Industries."

FOR CLEAN AIR . . . THE INVISIBLE ***TOOL*** **KIRK AND BLUM**
DUST CONTROL SYSTEMS

THE KIRK & BLUM MFG. COMPANY, 2876 SPRING GROVE AVE., CINCINNATI 25, OHIO

Chapman Valves meet ASTM "Class 50" specifications *with Nickel Alloy Cast Iron*



50,000 PSI MINIMUM TENSILE STRENGTH DEVELOPED IN VALVE CASTINGS WEIGHING UP TO FIFTEEN TONS EACH

Containing 2.00 per cent nickel, 0.25 per cent molybdenum and 0.75 per cent chromium . . . these vital units cast by The Chapman Valve Manufacturing Company of Indian Orchard, Mass., comprise key parts of the equipment being supplied for the Delaware Aqueduct by S. Morgan Smith Company, York, Pa.

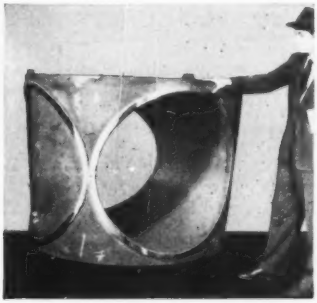
THE flow of a great underground river of Catskill mountain water for New York City will be controlled in subsurface valve chambers by these Chapman cone valves made of nickel alloy cast iron.

The nickel alloy iron adopted for these castings meets A.S.T.M. "Class 50" specifications, and provides sound, dense, high-strength units. Aqueduct valves, however, operate partially closed for long periods, and the resultant turbulence attacks surface metal of both seats and rings. To defeat this corrosive and erosive action, the Board of Water Supply specifies that these parts be faced with Monel*. The valve manufacturer applies Monel over a base layer of Ni-Rod*, the nickel electrode specially developed for cast iron welding.

Readily developing 50,000 p.s.i. tensile strength minimum, these valves exemplify how the right nickel cast iron not only helps foundrymen meet high mechanical property specifications, but the metal also assures trouble-free performance for the ultimate user.

Write for our recommendations regarding the best nickel alloyed iron for your applications.

*Reg. U. S. Pat. Off.



This cone for the 42" Chapman nickel iron valve body, pictured above, shows the Monel facing applied over a Ni-Rod base to provide maximum resistance to erosion and corrosion.

EMBLEM OF INCO SERVICE

Over the years, International Nickel has accumulated a fund of useful information on the properties, treatment, fabrication and performance of engineering alloy steels, stainless steels, cast irons, brasses, bronzes, nickel silver, cupro-nickel and other alloys containing nickel. This information is yours for the asking. Write for "List A" of available publications.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.

York Corporation
for finer finish
The York Corporation, manufacturer of refrigeration and air conditioning units, and operator of large iron foundries, is a regular user of No. 172 Mexican Blacking to produce castings with a *better finish and reduce foundry production costs.* No. 172 is a high quality wet blacking, containing a binder, that can easily be applied to cores and dry sand molds with spray, brush, or swab. It permits the sand to peel freely, leaving a smooth-surfaced casting *that requires minimum cleaning.* No. 172 Mexican Blacking is recommended for medium, extra large and pressure castings weighing 1 to 25 tons. No. 172 is also an excellent core coating. Only water is required to prepare for use. Other Mexican Graphite products include Cordip —for dipping or spraying dry or green sand cores— and Mexacote—for cores and molds in light and medium production casting where extra resistance to high temperature metal is demanded.
THE UNITED STATES GRAPHITE COMPANY

uses Blacking on castings

Three stages of mold preparation at the York Corporation with No. 172 Mexican Blacking. (1)—Mold being sprayed with No. 172. (2)—Mold ready for drying after spraying. (3)—Sprayed mold torch dried and ready for casting.

A typical casting produced U. S. Graphite No. 172 Mex Blacking at the York Corporati Note the fine finish and overall clean appearance of the casting.

No. 172 Mexican Blacking

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN

THE USE OF AJAX PHOSPHOR-COPPER

Send for booklet
"INGOT METALS OF TODAY"

●

15 STANDARD ALLOYS BY AJAX

Ajax Tombasil
Ajax Plastic Bronze
Ajax Anti-Acid Bronze
Ajax Phosphor Bronze
Ajax Red Brass Ingots
Ajax Manganese Bronze
Ajax High-Tensile Manganese Bronze
Ajax Golden Glow Yellow Brass
Ajax Nickel-Copper 50-50%
Ajax Manganese Copper Alloys
Ajax Aluminum Copper
Ajax Phosphor Copper
Ajax Silicon Copper
Ajax Nickel Alloys
Ajax Phosphor Tin

NOTE

"Proper Melting Decreases Foundry Losses," contains interesting data. Also, the booklet, "Nonferrous Ingot Metals of Today." Write for both of these. They are free.

Successful foundrymen deoxidize or "clean up" molten metal by a scientific method worth using *as indicated:*

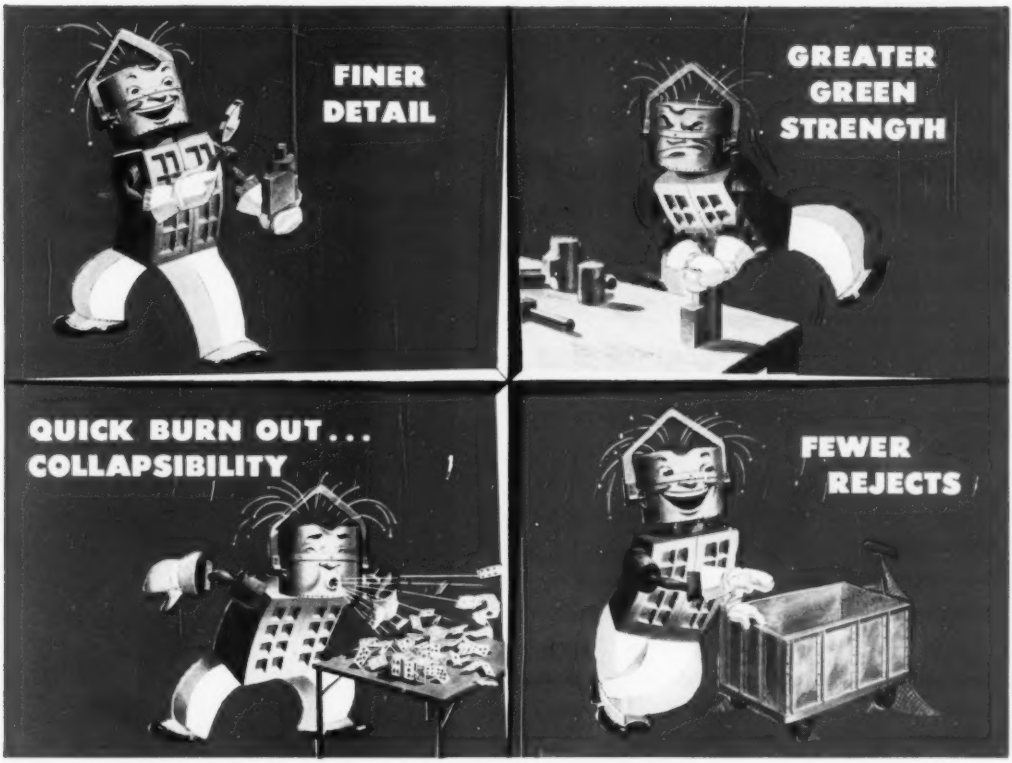
They use phosphorus . . expertly . . in the form of "Ajax Phosphor Copper" . . added as the crucible is removed from the furnace . . for virtually all brass and bronze alloys.

In notched waffle sections, or in shot form, Ajax 15% P-Cu does its work at .01% (1 oz. per 100 lbs.). Introduced, and having time to react when stirred with a whirling motion of the skimmer, it causes oxides to rise for effective removal by skimming from the surface. It is best to avoid phosphorus build-up from back stock.* . . If you use phosphorus these days, use Ajax Phosphor Copper (useful also in producing your phosphor bronze)

THE **AJAX** METAL COMPANY
ESTABLISHED 1880 PHILADELPHIA

ASSOCIATE COMPANIES:
AJAX ELECTRIC FURNACE CORPORATION, *Ajax-Wyatt Induction Furnaces for Melting*
AJAX ELECTROTHERMIC CORPORATION, *Ajax-Northrup Induction Furnaces for Melting, Heating*
AJAX ELECTRIC COMPANY, INC., *Electric Salt Bath Furnaces*
AJAX ENGINEERING CORPORATION, *Ajax-Tama-Wyatt Aluminum Melting Furnaces*

WHAT EVERY CORE-MAKER NEEDS AND WANTS:



YES — the qualities you need and want are yours in Krause's Cereal Binders—TRUSCOR (light weight) and AMERIKOR (heavy weight).

So why not take advantage of all these benefits by placing your next order with any of the distributors listed below or with us direct.

CHAS. A. KRAUSE MILLING CO., MILWAUKEE 1, WISCONSIN

World's largest dry corn millers

CEREAL BINDERS

DISTRIBUTORS

M. A. Bell Co.
Denver, Colo.
M. A. Bell Co.
Houston 2, Texas
M. A. Bell Co.
St. Louis 2, Mo.
A. L. Cavedo & Son, Inc.
Richmond 21, Va.

Foundry Supplies Co.,
Chicago 16, Ill.
J. H. Hatten & Son, Aldan,
Delaware Co., Pa.
J. B. Hayes Co.
Birmingham, Ala.
Independent Foundry Supply
Co., Los Angeles 11, Calif.

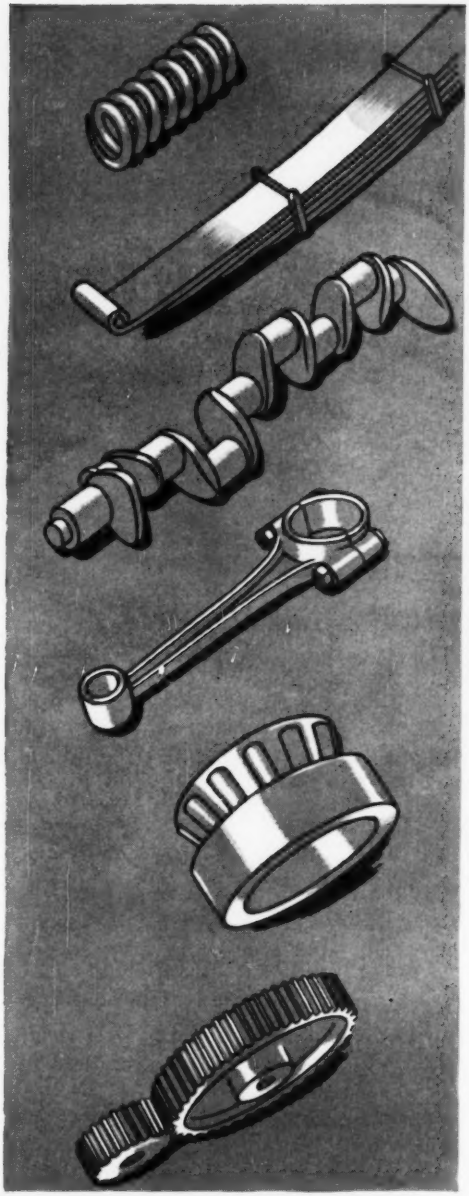
Marthens & Co., Moline, Ill.
Carl F. Miller & Co.
Seattle 4, Wash.
Milwaukee Chaplet & Mfg.
Co., Milwaukee 4, Wis.
Pacific Graphite Works
Oakland 8, Calif.

Porter-Warner
Chattanooga 2, Tenn.
Smith-Sharpe Co.
Minneapolis 14, Minn.
Frederic B. Stevens, Inc.
Buffalo 12, N. Y.
Frederic B. Stevens, Inc.
Cleveland 14, Ohio

Frederic B. Stevens, Inc.
Detroit 26, Mich.
Frederic B. Stevens, Inc.
New Haven 11, Conn.
Western Industrial Supply Co.
Portland 14, Ore.

VANADIUM

FOR HIGH DYNAMIC STRENGTH...



Vanadium steels are especially suited for parts subjected to high dynamic stress. Because of their uniformly fine grain size, they have exceptional resistance to shock and impact. Small amounts of vanadium in steel increase both yield strength and ductility. Vanadium-bearing steels are also noted for their high fatigue strength and abrasion resistance.

Vanadium steels are readily cast, forged, and rolled. They are also easily welded. When vanadium is added to steel in quantities ranging from 0.05 to 0.20 per cent, heat-treatment is simplified. Bearing surfaces can be carburized or nitrided to give unusual wear resistance.

For the production of vanadium steels, ELECTROMET ferrovanadium, containing 50 to 55 per cent vanadium, is available for immediate delivery in grades and sizes suitable for any open-hearth or electric-furnace addition.

Take advantage of the services of ELECTROMET's staff of trained metallurgists. They will be glad to give complete on-the-job technical assistance in the use of ferro-vanadium or any other ELECTROMET ferro-alloy or alloying metal.

Write to the nearest ELECTROMET office.

ELECTRO METALLURGICAL DIVISION
Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
OFFICES: Birmingham • Chicago • Cleveland • Detroit
New York • Pittsburgh • San Francisco
In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

Electromet
TRADE-MARK
Ferro-Alloys and Metals

Got a Casting problem?

For more than half a century, Stevens has specialized in the manufacture and application of *quality-controlled* foundry facings. During that time we have accumulated a most representative case history file of successful accomplishment.

Today, this broad background of specialized experience and knowledge is concentrated in a most complete line of "job-qualified" core and mold coatings, any one or more of which might be the answer to your specific casting problem.

Whether you're pouring gray iron, brass, bronze, aluminum or magnesium, you will find it worthwhile to discuss your casting operations with a Stevens representative.

You will find he is qualified in every way to help you benefit through the proper application of Stevens "job-qualified" foundry facings. He is capable of proving his recommendations in terms of results in your plant, on the job, if you will permit him to do so.

Should it be determined that your requirements are such that they cannot be answered by our standard core or mold coatings, he will enlist the assistance of Stevens foundry specialists, laboratory staff and facilities in developing a formulated facing that answers your particular need. Let a Stevens representative *show you the way* to better casting production through better foundry facings. You would be wise to call him in today.

SINCE 1892 STEVENS EVERYTHING FOR A FOUNDRY

LEADING MANUFACTURERS AND DISTRIBUTORS OF FOUNDRY FACINGS, EQUIPMENT AND SUPPLIES

FREDERIC B. Stevens INCORPORATED

DETROIT 16, MICHIGAN

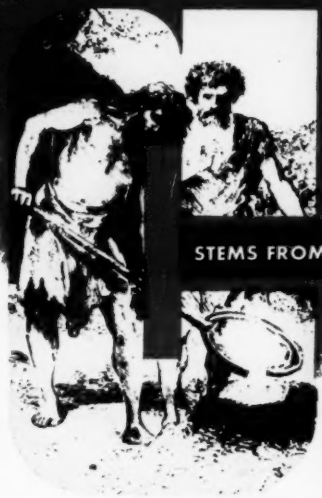
FOUNDRY EQUIPMENT AND SUPPLIES DIVISION

Branches • Sales Offices • BUFFALO • NEW HAVEN • MINNEAPOLIS • CLEVELAND • [illegible]

FREDERIC B. STEVENS OF CANADA, LTD. WINDSOR, TORONTO, ONTARIO

PRIDE OF CRAFT • PRIDE OF CRAFT • PRIDE OF CRAFT

Pride of Craft

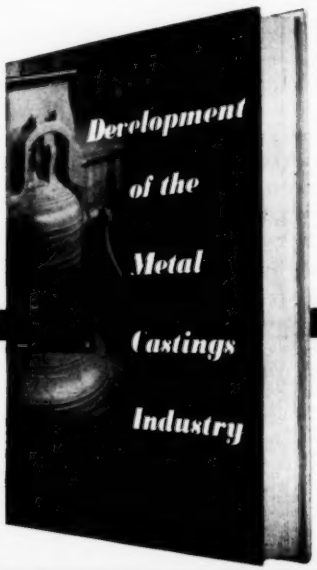


This history of foundry practice, from the days of prehistoric development of metal to modern castings production, brings into sharp focus the fact confirmed by scientific history . . *progress can be only as swift as research and equipment permit.*

It is the story of man's achievements, through his use of metal, which have contributed so essentially to modern civilization.

Profusely illustrated, this clothbound, 250-page book enables the modern foundryman to glean a deeper appreciation of the field in which he operates. A combination of fact and romance, "*Development of Metal Castings Industry*" dramatizes the progress of foundry practice . . . a craft as old as man-kind . . . industry that constantly attunes itself to the [illegible] modern living.

STEMS FROM AN APPRECIATION OF HISTORICAL BACKGROUND



AN AFS PUBLICATION

- ACCURATE HISTORICAL DATA
- REPRODUCTIONS OF AUTHENTIC AGE-OLD CASTINGS
- STIMULATING RECREATIONAL READING
- CHRONICLE OF A GREAT, WORLD-WIDE CRAFT

Order Your Copy Today

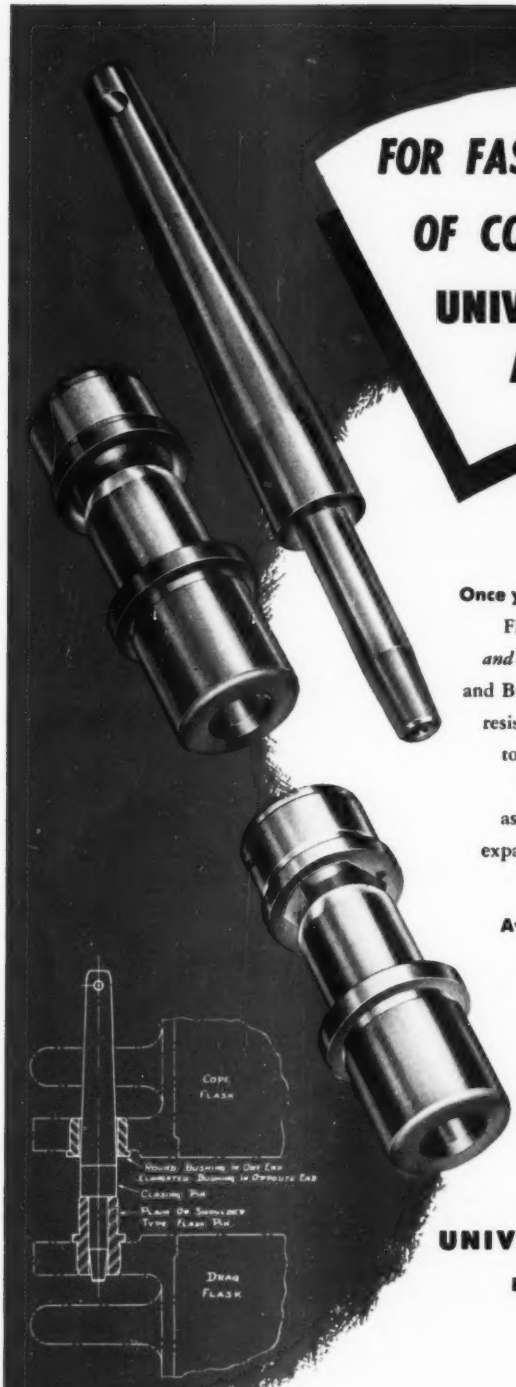
American Foundrymen's Society
222 West Adams Street, Chicago 6, Illinois

Send immediately my copy of "*Development of the Metal Castings Industry.*" *Remittance is enclosed.*

☐ $5.00 AFS Member Price
☐ $7.50 Non-Member Price

Name ..... Position .....
Company .....
Street .....
City ..... Zone ..... State .....

FOR FAST, ACCURATE LINE-UP OF COPE AND DRAG, USE UNIVERSAL FLASK PINS AND BUSHINGS



Once you install Universal precision made Standardized Flask Pins and Bushings *you can forget about cope and drag alignment troubles.* Universal Flask Pins and Bushings are hardened and ground for maximum resistance to wear. Cope Bushings are quickly guided to the Drag Pins over tapered, loose-fitting closing pins which are easily removed after assembly. Special design permits longitudinal expansion to compensate for metal heat, *without affecting accurate alignment.*

Available for immediate delivery in several sizes of round, elongated, press fit and taper types for use in cast iron, steel, aluminum, and magnesium flasks. *Special types and sizes to order.* Write for complete information.

UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 12, MICHIGAN

KEOKUK KWIZ

Q: WHAT IS THE PERFECT MIX FOR CUPOLAS AND THE PERFECT BLOCK FOR OPEN HEARTH HEATS?

A: KEOKUK ELECTRO-SILVERY

because of:

1. Uniformity ... accurate percentages of silicon, iron and alloys, as desired.

2. Control ... specially processed in the electric furnace it has all the advantages of complete and constant control.

3. Easy Handling by Magnet

4. Orderly stock piles and accurate handling—no contamination is possible.

WRITE FOR

Free twenty-two page book—beautifully illustrated in full color.

Four page booklet completely explaining the advantages of Keokuk Electro-Silvery 12½ lb. piglets.

60 lb. pigs for blocking the open hearth heat.

30 lb. pigs for charging the cupola mechanically or by hand.

12½ lb. piglets so uniform in weight that they may be charged into the cupola by hand.

60-lb. pigs for steel plants

30-lb. pigs and 12½-lb. piglets for foundries.

KEOKUK
electro-silvery

BY KEOKUK ELECTRO-METALS COMPANY
KEOKUK, IOWA
WENATCHEE DIVISION, WENATCHEE, WASHINGTON

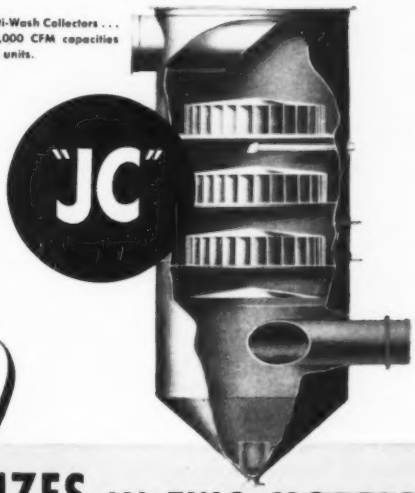
SALES AGENTS: Miller and Company
332 S. Michigan Avenue, Chicago 4, Illinois
3504 Carew Tower, Cincinnati 2, Ohio
407 N. Eighth Street, St. Louis 1, Missouri

SMALL *or* LARGE . . . ONE *or* MANY—
MULTI-WASH COLLECTORS

FIT ANY FOUNDRY . . . CONTROL CONTAMINATION

JUNIOR Multi-Wash Collectors . . . 1,000 to 30,000 CFM capacities and multiple units.

SENIOR Multi-Wash Collectors . . . made in 1,500 to 30,000 CFM capacities and multiple units.



60 SIZES IN TWO MODELS

Profit from the experience of prominent foundry operators: *Multi-Wash Wet Method of eliminating foundry dust, gas and fumes from the air is unexcelled in effectiveness and in efficiency!* Multi-Wash was far in advance of conventional methods in 1921, when first built. Constant improvements in design, construction and application keep it far in advance today. *And there's a size to fit your need!*

SCHNEIBLE Multi-Wash Collector Towers have no moving parts to wear, burn or freeze, require no maintenance, can be installed and practically forgotten. They conserve floor space because they can be installed in building lantern or outdoors instead of on floor. They improve working conditions and promote a better community spirit.

We've made hundreds of successful applications, including special designs and arrangements to cope with unusual conditions. Write today for further data and information.

CLAUDE B. SCHNEIBLE COMPANY

2827 Twenty-Fifth St. • Detroit 16, Michigan

U.S. and Foreign Patents Pending

MANUFACTURERS ASSOCIATION INC. FOUNDRY EQUIPMENT

SCHNEIBLE

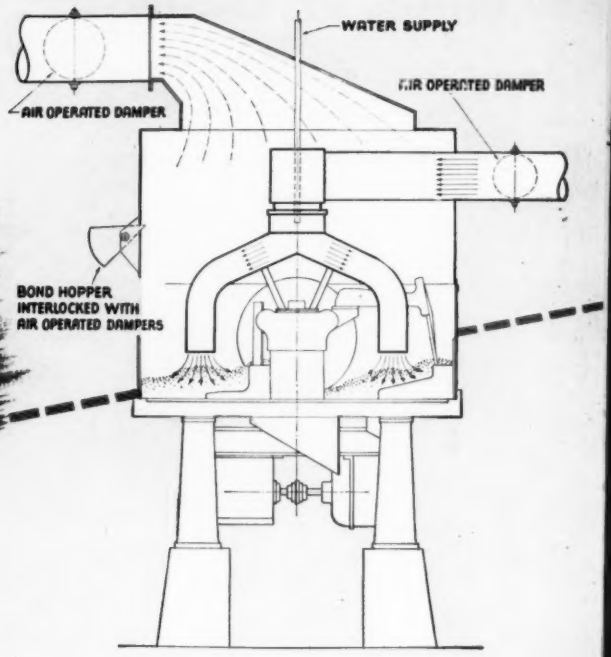
Here's the solution to your HOT SAND problem...

Install the new National Rotary Cooling Hood on your Simpson Mixer

—IMPROVES MOLDABILITY
—REDUCES SCRAP
—CUTS OPERATING COSTS

THE new National Rotary Cooling Hood now offers a tested and proved solution to the problem of rapidly and efficiently cooling hot foundry sands. Reports from users in many sections of the country offer positive proof that this new high-capacity Cooling Hood provides *complete control* of sand temperatures throughout a wide range of mixing cycles, even under the most extreme sand temperature conditions.

National Rotary Cooling Hoods are now available for installation on standard Simpson Intensive Mixer models. Plan now to install these Cooling Hoods on new or existing Simpson Mixers. Descriptive literature will be sent on request.



Here's how it works...

The basic principle employed in the new Rotary Cooler is the proved mechanical principle of cooling through evaporation. Excess moisture is added to the sand, and air at high velocity is forced through the sand as it passes over the plows. As the moisture is evaporated, the heat in the sand is transferred to the vapor generated, and carried out of the mixer. A slight vacuum is maintained in the mixer to prevent dust laden air from escaping into the work area.

LET A NATIONAL ENGINEER SHOW YOU HOW THE NEW ROTARY COOLING HOOD WILL HELP SOLVE YOUR HOT SAND PROBLEMS...

Call or write for details!

NATIONAL ENGINEERING COMPANY

600 MACHINERY HALL BUILDING • CHICAGO 6, ILLINOIS

Manufacturers and Selling Agents for Continental European Countries—The George Fischer Steel & Iron Works, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia—August's Limited, Halifax, England. For Canada—Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd., Sydney, Australia.

SALUTE to A. F. S. COMMITTEES

MEMBERS OF A.F.S. national committees, numbering over 500 and all top talent, serve without pay to increase the sum total of foundry knowledge for the benefit of all foundrymen, ferrous and non-ferrous, in foundries everywhere.

Technical committees of the Society have developed standards of foundry practice, codes of safe operation, books on foundry methods and metallurgy, Convention programs and research plans, each a large project in itself. Foundrymen from all over the world have been bringing their problems to A.F.S. by letter or in person for years. Each year these problems have become more numerous, requiring expansion of the type and number of committees. The result has been a continually expanding service to the worldwide foundry industry with solutions to foundry problems being provided as skillfully, constructively and promptly as possible.

The program of the 53rd Annual A.F.S. Convention provides a striking current example of the strength and value of the Society's technical committee structure. Vertebrae in the backbone of the Society, the committees in securing, reviewing, screening, and in some cases writing, the papers presented are interpreting a policy laid down over 53 years ago by the founders of the organization.

Today's committee members, as those of years gone by, bring to meetings their experience and knowledge. They return to their plants with additional information secured from their fellow committee workers. Busy men in their own right, they are more valuable to their organizations as a result of this interchange made possible by A.F.S. committee work.

Foundry management continues to have a hand in furthering foundry technology through A.F.S. committees, directly by active participation, indirectly by enabling key technical and operating personnel to participate. Management also contributes materials, and laboratory and production facilities, thus aiding in the prosecution of individual, committee and cooperative investigations. This spirit of cooperation which marks all participation in A.F.S. activities is convincing evidence that management continues to look to the Society for technical leadership.

Information developed or stimulated by A.F.S. activity, or attracted to the Society as the logical outlet for foundry technical ideas, is available through AMERICAN FOUNDRYMAN, through Convention papers which subsequently appear in TRANSACTIONS OF A.F.S., through the Society's special publications and through chapter meetings. These . . . the increase in national committee personnel and output . . . the continued growth of A.F.S. membership . . . attest to the significance of Society technical operations.

A salute to our technical committees is a vote of confidence in committee members and all who make it possible for them to work together in the steady development of the metal castings industry.

T. H. Benners, Jr.

T. H. BENNERS, JR.
National Director
AMERICAN FOUNDRYMEN'S SOCIETY

Elected a National Director of the American Foundrymen's Society at the 1948 Convention in Philadelphia, T. H. Benners, Jr., is a charter member of the Birmingham District Chapter and served as its vice-chairman in 1945-46 and chairman the following term. A partner in the firm T. H. Benners & Co., Birmingham, Ala., dealing in foundry raw materials, he graduated from Virginia Military Institute, Lexington, Va., in 1920 with a bachelor of science degree in chemical engineering. He was in the field artillery in the first World War and in the recent war was in the chemical warfare service at Edgewood Arsenal and later, as a major, was an operations and training officer with the Allied Force Headquarters in Algiers.

This is your Society, and the direction of its activities follows those lines in which you and the other more than 10,000 members have expressed interest. This "Annual Report to the Membership," therefore, is a progress report on what has been undertaken, and what is being planned for the future, in your behalf.

In a major technical society such as A.F.S. there can be no "silent" partnership, for every member has equal opportunity to participate in its activities and to benefit from them. For 53 years, thousands of foundrymen have played an active part in the affairs of A.F.S. and, in doing so, have reaped rich rewards for themselves and their companies.

Their opportunities, however, have not been exceptional, but universal. They have merely *used their membership*. The same opportunities exist today for any member willing to participate in what A.F.S. offers in the way of personal knowledge and advancement.

LEADERSHIP

During the eventful and sometimes difficult year 1948-49, the progress of your Society was guided by President W. B. Wallis of Pittsburgh, Pa. and Vice-President E. W. Horlebein of Baltimore, Md. Under their active leadership, A.F.S. has advanced along those principles that have governed the Society since 1896. Their efforts have brought the Society still greater recognition in every section of the metal castings field.

It was in keeping with a majority vote of the entire membership that the Society changed its name on July 1, 1948, from American Foundrymen's Association to American Foundrymen's Society, conforming with its recognition as one of the major technical societies of the industrial world.

At that time, the membership topped 10,000 and the total membership count has continued to stay above that mark, despite a leveling off period following a greatly accelerated war-time production.

REVISED DUES STRUCTURE

It was on January 1, 1949, that the dues structure was modified to enable A.F.S. to continue to serve this expanded membership without curtailment of essential services, even though the Society has been faced with greatly increased costs in every activity.

In establishing the revised dues structure, the A.F.S. Board of Directors insured a program that will yield a return to each individual member, by enabling the Society to carry through the projects charted for completion and others still to be undertaken as additional funds are made available . . . projects which, in themselves, mean increased service to the membership.

RESEARCH

The primary purpose of all A.F.S. activities, of course, is to coordinate and further the technical knowledge of all members in the Castings Industry generally. Over the years, the expanding A.F.S. program emphasized the need for Society-sponsored research on fundamental problems. As a consequence, the Board of Directors, in 1946, approved a plan whereby the Society agreed to sponsor and finance research projects recommended by its technical divisions.

Under this plan, a number of projects have been approved and initiated, and definitive contracts signed with several prominent institutions to carry on the work. Contracts are let on a bid basis and institutions selected by the Research Committees, with provisions for protection of A.F.S. members' rights on patentable developments.

The American Foundrymen's Society believes that its current investigational projects are contributing valuable material to the advancement of the industry as a whole. Research projects are now being conducted as follows:

Aluminum & Magnesium Division—"*A Study of the Principles of Gating*," Battelle Memorial Institute, Columbus, Ohio.

Malleable Iron Division—"*The Surface Hardening of Pearlitic Malleable Iron*," University of Michigan, Ann Arbor, Mich.

Brass & Bronze Division—"*The Fracture Test as an Indication of the Melt Quality of Tin Bronze*," University of Michigan.

Sand Division—"*Properties of Sand at Elevated Temperatures*," Cornell University.

Steel Division—"*Influence of Mold Conditions on the Development of Hot Tears in Steel Castings*," Armour Research Foundation.

Centrifugal Casting—"*The Study of Feasibility of Centrifugally Casting Light Alloys*," Canadian Bureau of Mines, Ottawa, Ontario.

Heat Transfer Committee—"*Heat Transfer Analyses*," Columbia University.

Cupola Research—"*Coke Quality and Its Relation to Gray Iron Melting*," a cooperative project involving a full-time A.F.S. Research Worker, the Cupola Research Committee and the Gray Iron Research Institute. Another research project will involve "Slag Composition and Its Effect on Melting."

Gray Iron Research—"*Gating and Risering of Gray Iron Castings*," A.F.S. Gating and Risering, and Gray Iron Research Committees.

EDUCATIONAL ACTIVITIES

All educational work of A.F.S. is conducted solely in recognition of the need to interest more young men in foundry work. During the past year, your Society has confined its activities largely to high school and trade schools, leaving to the Foundry Educational Foundation, for the most part, activities at the college and engineering school level.

Several A.F.S. Chapters have revived foundry training interest in their local training schools, as the Hackley School in conjunction with the Western Michigan Chapter. Other Chapters have set up scholarship funds and several more are now planning such activity for the coming year.

Several Chapters have been active at the college level also—for example, the St. Louis Chapter with the School of Mines and Metallurgy at Rolla, Mo. Meanwhile, A.F.S. has continued to sponsor the broadening program of F.E.F. which now embraces all of the major foundry associations.

The 1949 A.F.S. Apprentice Contests at St. Louis drew 71 entries with 50 foundry companies represented, and 7 A.F.S. Chapters carried on local elimination contests. First prize winning apprentices again were brought to the St. Louis Convention to receive their awards in person. Interest in these contests is constantly increasing.

PUBLICATIONS

Several new publications were issued during 1948-49, others reprinted and several new and revised publications are in progress.

"Development of the Metal Castings Industry," by B. L. Simpson, was announced in September, and this book has since received two awards for outstanding design and appearance. Long needed, copies have been shipped all over the world.

"Apprentice Training Standards" was distributed in June; the "Cupola Handbook" was reprinted by popular demand in April. Other books under revision are the "Core Book" and the "Sand Testing Handbook."

Bound Volume 56 (1948) "Transactions" was distributed in December, and it is intended that future volumes will be published at no later date each year. Some 57 1949

Convention papers were reprinted and made available to the membership in pamphlet form, or in "American Foundryman," well in advance of the St Louis Convention.

New publications in process include "Apprentice Training Methods" (companion to "Standards"), "Metallography of Cast Metals," "College Research Projects," a college textbook on foundry practice, revision of the Pattern Color Chart, and a Patternmaking Manual in work during the past two years.

A.F.S. Publications are made available to the membership at minimum price. They no longer are distributed gratis to the membership (except certain copies of "Transactions").

53RD ANNUAL CONVENTION

Technical sessions at the St. Louis Convention, May 2-5, attracted in large part foundry management and top personnel from throughout the country. Some 47 sessions, roundtable meetings and shop courses were presented, attendance at all being up to expectations. The program included presentation of A.F.S. Research Reports, a symposium on Nodular Graphite Gray Iron, exchange papers from the British and Australian foundry institutes, the Charles Edgar Hoyt Lecture, a joint Gray Iron-Steel Session on gating, a Safety and Hygiene Session and a full complement of papers covering every phase of foundry production.

Annual elections of officers and directors of the Society, and presentation of awards to prize-winning apprentices, featured the Annual Business Meeting. The Convention was climaxed by the Annual Banquet at which time gold-medal awards were presented to G. Vennerholm, R. J. Anderson and S. C. Massari; and honorary life memberships presented to A. J. Haswell, R. L. Lee, C. J. Freund and W. B. Wallis.

SAFETY AND HYGIENE

After considerable exploratory meetings, A.F.S. reestablished, during 1948-49, its Safety and Hygiene Committee for the express purpose of bringing up-to-date all existing codes affecting foundry housekeeping and safety practice. The Committee's program of making "the foundry a good place to work" necessarily will tie-in closely with the task of bringing more young men into the Industry. Among contemplated Committee projects are dust control devices, smoke abatement recommendations and elimination of health and accident hazards.

CHAPTERS

One new regular Chapter (Mo-Kan) was installed at Kansas City, Mo. and three student Chapters officially installed at Oregon State College, University of Illinois and Texas A & M College. In each case, nearby Chapters set up advisory committees to assist the student groups, provide speakers and, where necessary, work toward improvement of foundry teaching facilities.

During 1948-49, President W. B. Wallis completed the most ambitious undertaking of visiting the Board of Directors of every regular and student Chapter in the Society, completing the round with a visit to the Mexico City Chapter, in April. These visits, plus constant contacts by Board members under the direction of Vice-President E. W. Horlebein, brought about much closer relations and understanding between the National Organization and its Chapters, designed to chart the course for a greater metal castings field.

A.F.S. Chapter meetings during the past year numbered over 400, including Regional Conferences at Montreal, Que.; Lansing, Mich.; Birmingham, Ala.; Milwaukee; Columbus, Ohio; Lafayette, Ind. and Cambridge, Mass.

Prior to opening of the Chapter season, all Chapter Chairmen and Vice-Chairmen were invited to attend the 5th Annual Chapter Chairman Conference held in Chicago at A.F.S. expense. These annual conferences have been instrumental in coordinating the work of the Society and improving the level of Chapter activities for the benefit of the local membership.

A Manual of Chapter Operations was prepared late in the year for guidance of local Officers and Directors in conducting Chapter affairs. All Chapter boundaries were completely revised and approved for the first time since 1934. All told, the cost of Chapter activities to the Society during 1948-49 totaled at least $75,000. Broader interest on the part of foundry management constantly increases the value of Chapter work.

TECHNICAL ACTIVITIES

A.F.S. technical activities during the past fiscal year have continued at a high rate, commensurate with the steadily growing recognition on the part of the Industry itself of those committee members who give so much time and experience, freely and willingly. Hundreds of technical inquiries are received annually at the National Office, resulting in the formation of advisory committees within each technical division, in order to aid the Staff in providing up-to-date information.

A.F.S. continued fundamental research on eight different projects, involving a total annual cost of nearly $50,000. Members are invited to study the full story of A.F.S. research in the April, 1949 issue of "American Foundryman." Research findings of your Society are made freely available to the membership and this work is financed out of current funds.

All technical activities of the Society are reviewed annually by the Technical Correlations Committee whose function is to avoid overlapping, or unnecessary, projects and to prescribe methods for carrying on activities of interest to more than one division.

NATIONAL CASTINGS COUNCIL

A.F.S. continued representation on the National Castings Council which, during 1948-49, fulfilled its original purpose with the establishment of foundry advisory committees to the Munitions Board. The Council has had a broad overall program under consideration (see p. 21, March, 1948, "American Foundrymen"). Several meetings of Council members administrative heads commenced in January and, undoubtedly, will lead to still further cooperation within the Industry.

STAFF ORGANIZATION

In line with most elements of the Castings Industry, the National Staff of your Society took a number of reorganizational steps during the past year leading toward reduction of operating expense, and tending toward making a maximum of current activities self-supporting. The Society's accounting system was completely overhauled and an Accounting Manual prepared. The entire membership-handling system was completely overhauled and a semi-mechanical system installed.

The National Office now is being operated with a trained personnel whose continuity of employment and interest has been further assured by establishment of a staff retirement plan, provisions of which are entirely in keeping with similar plans in industry.

Due to a reduction in staff personnel in line with decreased operating expense, the cataloging of the A.F.S. library of some 1,500 volumes has been temporarily suspended.

"AMERICAN FOUNDRYMAN"

The Society's official monthly publication, "American Foundryman," was materially improved during the past year and a number of new features added, in keeping with the Industry's desire for practical information. New features include: "The Round Table," "Modern Foundry Methods" (picture stories), "Letters to the Editor," "Products Parade" (emphasizing new equipment and materials), international articles, and a broader editorial policy.

As a result of these editorial improvements, advertisers have responded, as expected, with the result that "American Foundryman" is now self-supporting. Advisory committees within the several technical divisions will be asked to review articles submitted and to provide specialized information.

Overall policy for "American Foundryman" has been placed in the hands of the Publications Committee of the Board, in line with your Society's obligation to give the membership a publication in keeping with the standards of a recognized technical society.

MEMBERSHIP

In spite of a general increase in membership dues on January 1, 1949, and some adverse business conditions, A.F.S. membership as of April 30 showed a slight increase over the total at the beginning of the fiscal year, July 1, 1948. Offsetting the loss of current members that a society necessarily expects, the monthly acquisition of new members has held up well. However, during the coming year, concentration of membership work will be on retention of membership through a campaign of "USE YOUR MEMBERSHIP."

Effective January 1, 1949, the Society commenced proration of all member dues so that, some time in 1950, all memberships in any one Chapter will come up for renewal at the same date each year, thereby concentrating the membership renewal work in any one Chapter within a two or three-month period.

The steady growth of the Society is due in large part to two major factors: the work of A.F.S. technical divisions, and the work of the Chapter membership committees. Nevertheless, many foundry executives still have failed to realize the full value of encouraging key personnel to hold membership and participate actively in the affairs of the American Foundrymen's Society. This is your Society — your technical Society—established and maintained in the broad belief that an industry progresses only as the firms within that industry progress, and the foundries progress only as their men utilize the best available information for doing a better job.

Technically submitted

AMERICAN FOUNDRYMEN'S SOCIETY

Wm W Maloney

Secretary-Treasurer

A. F. S. FOUNDRY CONGRESS & SHOW

Unlimited Exhibit — May 8-12, 1950

RETURNING AFTER FOUR YEARS, the American Foundrymen's Society will hold its 1950 Annual Convention and bi-annual Exhibit in Cleveland, May 8-12. Selected by the Board of Directors of the Society, the location and dates of the 54th Annual Foundry Congress were announced at the Annual Banquet at the end of this year's Convention in St. Louis.

The five-day Convention next May will combine a showing of new and improved foundry equipment and materials with well over 50 technical meetings, round-table luncheons and shop course sessions. In light of current business trends, interest is expected to be unusually high in foundry facilities and techniques which produce better castings at lower costs.

Continued interest abroad in American production methods is expected to bring a good representation of American Foundrymen's Society members and other foundrymen from all parts of the world.

Unlimited Exhibit Facilities Available

Exhibitors of past years are familiar with the excellent facilities available in the Cleveland Public Auditorium where the 50th Anniversary Convention was held in 1946. To be an unlimited exhibit again in 1950, space available will include the Arena, Auditorium Exhibit Hall, North-Exhibit Hall, the Arcade and Upper and Lower Lakeside Halls. Virtually on one floor, Convention attendants will be able to see all the exhibits with a minimum of stair climbing. Facilities will be available to house and service the heaviest and largest equipment.

Important parts of every A.F.S. Convention, plant visitations, ladies' entertainment program, foreign visitors' reception, Canadian Dinner and other Convention social events will be held in 1950. Convention host will be the Northeastern Ohio Chapter.

Plans for technical sessions and papers are already under way, one meeting having been planned as early as January, 1949. This session, a symposium on centrifugal casting, will be sponsored jointly by A.F.S. and the American Society for Testing Materials and will relate to the properties of centrifugally cast metals.

Schedule Research Reports, Exchange Papers

Other papers to be presented include the exchange papers of several foundry societies of other countries. This traditional international interchange of foundry information, in the case of the Institute of British Foundrymen, started in 1922 and has continued without interruption.

Another technical feature of the 1950 Convention will be detailed reports on progress on the nine A.F.S.-sponsored research projects. Technical highlight will be the Charles Edgar Hoyt Annual Lecture to be delivered in 1950 by W. W. Levi, Lynchburg Foundry Co., Radford, Va. His subject will relate to cupola operation in gray iron founding—a topic of intense interest to a great number of foundrymen.

Authors of technical papers for presentation at the 1950 Annual Convention and Foundry Show should submit them to the Technical Director, American Foundrymen's Society, 222 West Adams St., Chicago 6, Ill., not later than December 15 for consideration by the appropriate committee.

The Annual A.F.S. Apprentice Contest, an adjunct of the Convention since 1924, will be held for the 27th time in connection with the 1950 Foundry Congress. The competition opens October 1, 1949.

INTERNATIONAL FOUNDRY CONGRESS PROGRAM

SECOND INTERNATIONAL FOUNDRY CONGRESS since the war will be held August 29 through September 2 in Amsterdam, Netherlands, at the Royal Institute for the Indies. Host to this year's world-wide gathering of foundrymen will be the Netherlands Technical Foundry Association, headed by its president, F. W. E. Spies. President of the Organization Committee of the Congress is A. Baron Krayenhoff.

The week-long program combines technical sessions featuring papers from foundrymen of many countries, plant visitations, a special ladies' program and ample free time for personal visits and business. Following the Congress, attendants are invited to remain for the International Industries Fair to be held in Utrecht, September 6-15, and which will include several exhibits of foundry products.

Technical sessions start the afternoon of August 29, following opening of the Congress and luncheon. On the program are three groups of technical sessions, five excursions to industrial plants and several social events climaxed by the closing banquet. To be presented at one of the technical meetings is the A.F.S. Exchange Paper, *"Melting Furnaces in Ferrous Foundries,"* by A. W. Gregg, Whiting Corp., Harvey, Ill.

Program of the 1949 International Foundry Congress is as follows:

Monday, August 29

10:30 a.m.—OPENING SESSION. Royal Institute for the Indies, Amsterdam, Mauristkade 63.
12:30 p.m.—LUNCHEON. All members and their ladies. Hotel Krasnapolsky.
2:30-5:00 p.m.—TECHNICAL SESSIONS. Royal Institute for the Indies.
8:30 p.m.—SOCIAL EVENING. Members and ladies.

Tuesday, August 30

8:00 a.m.—Meeting of Congress members in the Central Railway Station, Amsterdam, for excursions to the foundries of (a) Koninklijke Machinefabriek Gebr. Stork & Co. and N. V. G. Dikkers & Co., Hengelo, or (b) N. V. Diepenbrock & Riegers, Ulft, and IJzer, Metaal en Tempergieterij v.h. B. Ubbink & Co. N. V., Doesburg.
8:15 p.m.—Back in Amsterdam.

Wednesday, August 31

8:30-12:00—TECHNICAL SESSIONS. Royal Institute for the Indies.
12:00 noon—Departure (members only) to the boat for IJmuiden for visit to Koninklijke Nederlandsche Hoogovens & Staalfabrieken N. V. to see blast furnaces, steel works, mills and pipe-foundry. Luncheon on board.
5:30 p.m.—Back in Amsterdam.
8:30 p.m.—Soiree-dansante, Apollo Pavilion, Amsterdam.

Thursday, September 1

8:00 a.m.—Meeting of Congress members in the Central Railway Station for excursions to the foundries and factories of (a) Nederlandsche Staalfabrieken v.h. J. M. de Muinck Keizer N. V. and Werkspoor N. V., Utrecht, or (b) N. V. Philips' Gloeilampenfabrieken, Eindhoven.
6:00 p.m.—Back in Amsterdam.

Friday, September 2

8:30-12:00—TECHNICAL SESSIONS. Royal Institute for the Indies.
12:30 p.m.—Excursion by motor launch through canals and harbor of Amsterdam. Members and ladies. Luncheon on board.
2:30 p.m.—Entertainment and tea. Royal Institute for the Indies. Members and ladies.
7:00 p.m.—CLOSING BANQUET. Minerva Pavilion, Amsterdam. Members and ladies.

The ladies' program, running concurrently with the Congress, includes a round of teas, visits to museums and art galleries and to the flower auction at Aalsmeer, luncheons, a trip along the North Sea Beach and dunes, an excursion to Delft, the Hague, Scheveningen and Noordwijk, and the special social events of the International Foundry Congress.

Correspondence regarding the 1949 International Congress and requests for hotel reservations should be directed to: Nederlandsche Vereeniging van Gieterij-Technici, Secretariaat Internationaal Gieterij-Congress 1949, Keizersgracht 192, Amsterdam-C, Netherlands.

Extend Malleable Research Project

THE MALLEABLE RESEARCH PROJECT has been extended another year by action of the Board of Directors after consideration of the recommendations of the Malleable Division's Research Committee. Conducted at the University of Michigan during the past year, the project is yielding data on the most desirable microstructure for pearlitic malleable iron castings to be selectively hardened.

A progress report on the project, *"Surface Hardening of Pearlitic Malleable Iron,"* was presented at the 53rd Annual A.F.S. Convention in May and will appear in this year's TRANSACTIONS OF A.F.S.

Reprint Three Popular Publications

THREE PUBLICATIONS of the American Foundrymen's Society have been reprinted recently. Now available is FUNDAMENTALS OF DESIGN, CONSTRUCTION, OPERATION AND MAINTENANCE OF EXHAUST SYSTEMS, containing detailed engineering data developed by the Safety & Hygiene Committee. This and other A.F.S. safety and hygiene literature was used as a basis for establishing many industrial codes in this country and abroad. Member price is $3.00. Non-member price, $5.00.

A new stock of BIBLIOGRAPHY OF PERMANENT MOLD CASTINGS, published by A.F.S., is available from Society headquarters, 222 West Adams St., Chicago 6, Ill. Member price is $1.50; price to non-members is $3.00.

The bibliography, reprinted to meet continued requests for information on permanent molds, covers American literature since 1896. It also contains a considerable proportion of British, German and French references on the subject.

BIBLIOGRAPHY OF PERMANENT MOLD CASTINGS contains some 250 references.

Second printing of the popular HANDBOOK OF CUPOLA OPERATION has been completed and books are available immediately. On view at the Publications Booth during the 53rd Annual A.F.S. Convention in St. Louis, the volume is selling rapidly. Member price is $6.00; non-member price is $10.00. Most extensive publication on cupola operations available, the 468-page HANDBOOK OF CUPOLA OPERATION was prepared by 128 leading foundry metallurgists, practical foundrymen and cupola operators. In addition to an extensive bibliography the book contains 188 graphs and illustrations and 34 tables.

TECHNICAL SESSION ATTENDANCE averaging larger than any previous A. F. S. Convention attested to the interest in foundry advances reported at the 53rd Annual A.F.S. Foundry Congress, held May 2-5 in St. Louis. Continuing the Convention news story started in the May issue, pages 36-45, "The Foundrymen's *Own* Magazine" concludes herewith the chronological summary of Convention activities. Major meetings of general interest—Annual Business Meeting, Charles Edgar Hoyt Annual Lecture, and Annual Banquet—were reported in May. Excerpts from principal addresses appeared on page 49, May issue.

Final brass and bronze session was the popular round table luncheon held at noon on May 3 and attended by well over 200. Subject of the discussion was "*Some Practical Applications of the Fundamental Principles of Melting, Pouring and Casting of Tin Bronzes.*" Discussion leaders were: *melting*, H. M. St. John, Crane Co., Chicago; *pouring*, L. W. Eastwood, Battelle Memorial Institute, Columbus, Ohio; and *gates and risers*, G. Bradshaw, Philadelphia Naval Shipyard.

In the customary style of the off-the-record luncheon meetings, foundrymen fired questions and received answers from the discussion leaders who gave specific replies to a variety of operating and technical problems. B. A. Miller, Baldwin Locomotive Works, Philadelphia, presided and co-chairman was H. L. Smith, Federated Metals Div., American Smelting & Refining Co., Pittsburgh.

Third round table luncheon of the Convention, sponsored by the Malleable Division, was held at the same time as the brass and bronze luncheon. Two subjects up for discussion were "*Reduction of Losses Due to Cracks or Tears*" and "*Improved Malleable Melting Refractories.*" Discussion leaders for the first topic were R. J. Anderson, Belle City Malleable Iron Co., Racine, Wis., and B. C. Yearly, National Malleable & Steel Castings Co., Cicero, Ill. For the discussion on refractories, leaders were M. J. Henley, Texas Foundries, Inc., Lufkin, Tex., and F. Czapski, Chicago Malleable Castings Co., Chicago. J. H. Lansing, Malleable Founders' Society, Cleveland, presided with A. M. Fulton, Northern Malleable Iron Co., St. Paul, Minn., as co-chairman of the session.

In discussing cracks and tears, the speakers brought out that cold cracks occur at low temperatures but are caused by conditions which existed at high temperatures. Remedy for cold cracks is to produce castings which are dimensionally stable at 1100 F, thus obviating the need for deformation in the temperature range where the castings are without ductility. Hot cracks occur above the critical temperature when the metal is weakest, the discussion leaders explained. Hard cores and molds which are expanding while the casting is contracting were given as important causes of hot tears.

During the refractories phase of the discussion, the significance of rool, side-wall and bung maintenance was brought out with increased refractory life mentioned as the goal of every melter. Most failures of fire clay plastic linings are the result of faulty preparation or application, the speakers said. The following should be avoided to attain improved refractory service: (1) Poor masonry work; (2) excessively high temperatures

frequently due to improper firing schedules or burner settings; and (3) excessively long holding periods after the cupola bottom has been dropped.

The Tuesday afternoon sand session featured a progress report, *"Elevated Temperature Properties of Steel Molding Sands,"* on the A.F.S. Sand and Research Project, a paper on plastic corebinders and a committee report entitled *"Causes of Rat-Tail Defects."* Clyde B. Jenni, General Steel Castings Corp., Eddystone, Pa., and T. W. Curry, Lynchburg Foundry Co., Lynchburg, Va., presided.

In his paper, *"Plastic Binders for Foundry Sand Practice,"* H. K. Salzberg, Borden Co., Bainbridge, N.Y., described urea resins and phenol resins commonly used as corebinders. Urea resins are used most effectively in cores for the light metals and malleable iron while the phenol resins of higher heat resistance are indicated for gray iron, steel and the heavy nonferrous alloys, Dr. Salzberg said. He explained that surface-active chemical agents added to the sand mix during preparation are highly effective in making a sticky mixture free-working.

Reports A.F.S. Sand Research Project

The sand research progress report, which like all papers on A.F.S.-sponsored research will appear in TRANSACTIONS OF A.F.S., was presented by John P. Fraser, Cornell University, Ithaca, N.Y. Mr. Fraser reported current details of the three-fold research program on the high temperature properties of steel molding sands. Under study are: (1) The behavior of molding sands when heated and cooled and the effect of time on the reactions; (2) Expansion-contraction characteristics of molding sand; and (3) Improvement of hot compressive strength tests with the view of establishing a tentative standard test procedure.

Harry W. Dietert, Harry W. Dietert Co., Detroit, outlined the work of the Committee on Physical Properties of Iron Foundry Molding Materials at Elevated Temperatures in correlating laboratory tests with the appearance of rat-tails on a flat test casting.

High hot compressive strength and high confined expansion are conducive to rat-tailing, said Mr. Dietert. Lowering either will alleviate the condition, he added, explaining that it is easier to change hot compressive strength than confined expansion. Best temperatures for performing the tests and a description of the equipment and method for the confined expansion test were given along with quantitative data.

These ladies of the St. Louis Chapter, hostesses to the 53rd A.F.S. Convention, were responsible for the Convention's successful Ladies' Entertainment.

The Annual Canadian Dinner was again this year an occasion for our northern neighbors to renew old friendships with their fellow Canadian foundrymen.

The initial session of the Pattern Division took place at 2:00 p.m., Tuesday, May 3, with A. F. Pfeiffer, Allis-Chalmers Mfg. Co., Milwaukee, presiding, and H. K. Swanson, Swanson Pattern & Model Works, East Chicago, Ind., as co-chairman.

Both R. G. Christensen, Wisconsin Pattern Works, Racine, Wis., author of *"Information Needed to Produce Satisfactory Pattern Equipment,"* and Albert Huebner, Allis-Chalmers Mfg. Co., Milwaukee, author of *"Maintenance of Wood and Metal Patterns,"* were unable to attend the session. Mr. Christensen's paper was presented by Leonard F. Tucker, City Pattern & Foundry Co., Inc., South Bend, Ind., and Mr. Huebner's paper was presented by Director-Elect Vincent J. Sedlon, Master Pattern Co., Cleveland.

Cites Good Patternmaking Practices

Speaking for Mr. Christensen, Mr. Tucker said that the most important single factor in foundry operation is the correct pattern equipment, and stated that the foundry should design the pattern, with the assistance of the patternmaker. Better working patterns, he said, can be made at a lower cost if the patternmaker does his work only to the specifications of the foundry. The speaker cited correct molding and production requirements and rigging information as the three most important factors in producing good pattern equipment.

Speaking for Mr. Huebner, V. J. Sedlon stated that it is generally agreed that the expense of keeping pattern equipment in first-class condition is an absolute necessity if foundries are to run efficiently and with a minimum of scrap losses. He went on to outline various materials used to repair patterns, such as wood-forming plastics, water putty, waxes and shellacs. In conclusion, Mr. Sedlon stated that the proper handling and storing of patterns is the best way to eliminate repairs, and said that as pattern equipment is the most important tool in the foundry, it should be kept in mind that it is an expensive tool and should be treated with utmost care.

R. A. Quadt, Federated Metals Div., American Smelting & Refining Co., Perth Amboy, N. J., and A. J. Juroff, Bendix Aviation Corp., South Bend, Ind., were chairman and co-chairman at the final light metals

Adding an international flavor to the President's Reception preceding the Convention were, left to right: Julio Con, Fundiciones de Hierro y Acero, Mexico City; Manuel Goicoechea, Hiero Maleable de Mexico, Mexico City; Delbert Luper, Iturbe y Zalce, Mexico City; N. S. Covacevich, La Consolidada, S. A., Mexico City; David Evans, Chicago Steel Foundries; John Watt, Russell Mfg. Co., Melbourne, Australia.

session the afternoon of May 3. The following three papers were presented: (1) *"Correlation of Cooling Curve Data with Castings Characteristics of Aluminum Alloys,"* by E. E. Stonebrook and W. E. Sicha, Aluminum Company of America, Cleveland; (2) *"Fluxing of Aluminum Alloys,"* a committee report presented by Hiram Brown, Solar Aircraft Co., Des Moines, Iowa; and (3) *"Grain Refining of Aluminum Alloys and Its Effect on Physical Properties,"* by Walter Bonsack and O. Tichy, Apex Smelting Co., Cleveland.

The first paper described a method for determining the cooling curves of aluminum casting alloys and for using the data to indicate relative fluidity and resistance to hot cracking. High eutectic and binary complex contents and smaller temperature intervals, in cooling from the coherent to the completely solid state, were associated with higher resistance to hot cracking.

Discusses Aluminum Alloy Fluxing

The report of the Sand Casting Committee of the Aluminum and Magnesium Division, on fluxing of aluminum alloys, discussed oxide removal and degassing, relative merits of fluxing materials and precautions to be observed in use. Pointing out that one of the most important methods of reducing gas porosity is to prevent the melt from becoming gassy in the first place, Mr. Brown described four types of fluxes for removal of oxides and gave their applications as well as limitations. For gas removal, dry and oxygen-free chlorine, nitrogen or boron trichloride were cited.

Grain refinement of aluminum alloys can be accomplished by increasing the rate of solidification and by use of grain refiners, Mr. Bonsack said in presenting the third paper of the session. He described studies in which four types of aluminum alloys were investigated, using sand and permanent molds, and titanium as a grain refiner. Results reported indicated that yield strength was the least affected of the properties tested. Mr. Bonsack concluded with the statement that the investigation confirmed previous observations that titanium addition will not cause improvements in mechanical properties as should be expected by the grain size reduction. However, he said, grain refining by titanium is still desirable for surface appearance, uniformity of grain size and machinability.

"Approach to Standard Costs in the Foundry" was presented by E. Ruffalo, Westover Engineers, Milwaukee, at the foundry cost session Tuesday afternoon. R. L. Lee, Grede Foundries, Inc., and George Tisdale, Zenith Foundry Co., both of Milwaukee, presided.

Standard costs are simply predetermined costs, Mr. Ruffalo said in explaining that the concept of the standard cost system is to flag excess costs or variations from standard. He compared the actual job order cost

Prominent educators and foundrymen attending the Annual Educational Dinner were, left to right: A. W. Gregg, Whiting Corp., Harvey, Ill.; E. E. Green, Indianapolis Public Schools; Fred B. Skeates, Link-Belt Co., Chicago; A.F.S. National Director-Elect Fred G. Sefing, International Nickel Co., New York; and G. K. Dreher, Foundry Educational Foundation.

system, in which actual costs are posted as the expenses are incurred, with the standard job order cost system, in which predetermined costs are charged.

He described the handling of the various elements of the standard cost system in considerable detail and in conclusion stated that knowledge of the facts is the first essential to intelligent action and that the cost system can only be justified to the extent that it provides the facts for management's guidance.

Following discussion of Mr. Ruffalo's paper the meeting was thrown open for a general question and answer period on cost problems of general interest, cost accounting methods, cost distribution and similar foundry cost considerations.

Hold Refractory Problems Panel

The panel discussion sponsored Tuesday afternoon by the Refractories Committee had as a theme *"Your Refractory Problems—What Are They?"* R. H. Zoller, Zoller Casting Co., Bettsville, Ohio, was chairman and R. P. Schauss, Illinois Clay Products Co., Chicago, was co-chairman. The off-the-record meeting drew a number of melters, furnace operators, metallurgists and maintenance men who came to get first hand information on installation, use and care of refractory furnace and ladle linings.

A symposium on nodular graphite cast iron, sponsored jointly by the Gray Iron and the Malleable

Divisions of A.F.S., drew the largest audience of any technical session at a Society Convention. Numbering over 700, the crowd gathered in the ball room of the Jefferson Hotel, the afternoon of May 3, to hear four metallurgists describe their experiences with the production and properties of iron in which graphite is in the form of nodules as-cast. H. Bornstein, Deere & Co., Moline, Ill., presided; co-chairman was C. O. Burgess, Gray Iron Founders' Society, Cleveland.

Nodular Graphite Session Heavily Attended

Participating in the symposium were: D. J. Reese, International Nickel Co., New York; Gosta Vennerholm, Ford Motor Co., Dearborn, Mich.; R. G. McElwee, Vanadium Corporation of America, Detroit; and C. K. Donoho, American Cast Iron Pipe Co., Birmingham, Ala. After presenting their papers, including some information already published plus latest data collected, the speakers were followed by a number of members of the audience who added their experiences to those already reported. Discussion was extensive.

Major conclusion of many in the audience was that the material is too new to be properly evaluated in terms of its ultimate place in the engineering field.

The time study and methods session had as its chairman E. G. Tetzlaff, Pelton Steel Castings Co., Milwaukee, with J. A. Westover, Westover Engineers, Milwaukee, substituting for M. E. Annich, American Brake Shoe Co., Mahwah, N. J., as co-chairman.

Professor Richard Schneidewind of the University of Michigan delivering the Exchange Paper of the Institute of British Foundrymen in the absence of its authors at the 4:00 p.m. Wednesday Gray Iron Session.

M. T. Sell, Sterling Foundry Co., Wellington, Ohio, in his paper, *"Developing Standard Data Tables for a Four-Man Molding Unit,"* presented charts showing standard data tables in actual use. He cited five outstanding reasons for using standard data tables: (1) Establishment of fair and equitable standards; (2) Time saving; (3) Gaining the confidence of the worker; (4) Predetermination of costs; and (5) Production control. Dividing timestudy factors into constants and variables, he explained how standard data are plotted for ready reference in setting standards.

Having completed the studies and set up the data, the next step is to arrange the standard values into a convenient table. Factor cards enable the timestudy man to record pattern characteristics and measurements and the values for the various factors and elements of work, Mr. Sell said. Pointing out that standard data tables remain workable only if all work factors remain the same as when the studies are made, he emphasized the importance of preparing a complete write-up on location of all equipment, formula of sand used and a complete analysis of the methods employed at the time the data are taken.

The Canadian Dinner, annual Convention gathering of foundrymen from the three north-of-the-border chapters—Eastern Canada and Newfoundland, Ontario and British Columbia—and from other Canadian areas, was held the evening of May 3. Primarily a social gathering, the group heard short talks by President W. B. Wallis, President-Elect E. W. Horlebein and Secretary-Treasurer Wm. W. Maloney. National Director E. N. Delahunt, Warden King, Ltd., Montreal, Que., presided at the session.

Discusses Core and Mold Ovens

Attendants at the Tuesday evening session sponsored by the Plant and Plant Equipment Committee heard Charles A. Barnett, Foundry Equipment Co., Cleveland, present a comprehensive, profusely illustrated discussion of modern foundry core and mold ovens. J. Thomson, Continental Foundry & Machine Co., East Chicago, Ind., and E. W. Beach, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., presided.

Properly selected core baking and mold drying equipment is essential in the present day foundry to minimize casting losses, to increase output of castings, to economize on core oven fuels, labor, materials and to make more effective use of valuable floor space, said Mr. Barnett. He explained the selection, operation and maintenance of the standard types of core and mold drying equipment and auxiliary materials handling facilities. Floor layouts showed the relationship of equipment to foundry production facilities.

The Tuesday evening gray iron shop course session discussion subject was *"Inexpensive Tests for Small Gray Iron Foundries."* Discussion leader was Walter Bohm, Buick Motor Division, G.M.C., Flint, Mich. Presiding at the meeting was Howard H. Wilder, Eaton Mfg. Co., Vassar, Mich., while Marshall Reichert, Banner Iron Works, St. Louis, was co-chairman.

Heavy attendance marked the technical and shop course sessions at the 53rd Annual A.F.S. Convention.

Mr. Bohm described simple control tests which gray iron foundries can use to check metal quality, mold conditions and other production factors. His description and explanation of a small double test casting used to study the occurrence and elimination of draws was particularly interesting to his audience. Making practical foundry tests following the experimental work, molds were produced in which half of the cope and drag were made of a sand mixture which caused draws and the other half of sand mixtures developed in the laboratory and found to eliminate draws.

The second sand shop course session held the evening of May 3 provided the answers to a number of practical operating problems confronting users of resin core binders. T. W. Curry, Lynchburg Foundry Co., Lynchburg, Va., was discussion leader. Replacing the men originally scheduled were Max Kuniansky, Lynchburg Foundry Co., who presided and Frank S. Brewster, Harry W. Dietert Co., Detroit, who acted as co-chairman of the session.

Mr. Curry described the experiences of his company with the production of resin bonded cores and told of a procedure for evaluating new resins and resin-sand mixtures. Interesting observations growing out of several years work with resin binders reported by Mr. Curry include: (1) Synthetic resin cores bake more rapidly than conventional cores bonded with oil; (2) Green and baked properties of resin bonded cores are affected by both type of mixer and mixing procedure; and (3) Resin core mixtures may stick in the boxes and may be difficult to blow unless appropriate release agents are included in the mixtures.

Describes Boron Additions to Iron

Wednesday morning's gray iron session featured papers on metallurgy and cupola operation. Presiding was R. G. McElwee, Vanadium Corporation of America, Detroit, with A. E. Schuh, U. S. Pipe & Foundry Co., Burlington, N. J., as co-chairman.

In his paper, *"Effect of Boron on Structure and Some Physical Properties of Plain Cast Irons,"* written with Harry Stern, also of National Bureau of Standards, Washington, D. C., A. I. Krynitsky described experiments in which boron ranging from 0.001 to 0.48 per cent was added to cast iron. In addition to noting an undercooling effect, the authors also reported an increase in chill and hardness, a decrease in size and quantity of graphite and an increase in the amount of eutectic structure.

John P. Fraser, research fellow at Cornell University, giving a progress report on the A.F.S.-sponsored Sand Research Project in operation at Cornell University.

Attending one of the evening Gray Iron Shop Courses were, left to right: Alexander D. Barczak, Superior Foundry, Inc., Lakewood, Ohio; Norman L. Peukert, Carondelet Foundry Co., St. Louis; Edward J. Burke, Hanna Furnace Co., Buffalo; Ralph M. Hill, East St. Louis Castings Co., East St. Louis, Ill.; and W. C. Wine, Sibley Machine & Fdry. Corp., South Bend, Ind.

D. E. Krause, Gray Iron Research Institute, Inc., and H. W. Lownie, Jr., Battelle Memorial Institute, both of Columbus, reported on 17 heats made in a 10-in. cupola in their paper, *"Blast Humidity as a Factor in Cupola Operation."* Operation of the cupola and properties of the iron, the authors found, showed a rapid response to change in the moisture content of the blast. Adjustments of the coke ratio and blast rate produced partial compensation but generally not sufficient to overcome the adverse effects of high moisture in the blast.

Three papers were presented at the May 4, 10:00 a.m., sand session. John A. Rassenfoss, American Steel Foundries, East Chicago, Ind., and H. K. Salzberg, Borden Co., Bainbridge, N. Y., presided. The first paper, *"pH of Foundry Sands,"* by Bradley H. Booth, Carpenter Bros., Inc., Milwaukee, reported the work of the author done in partial fulfillment of requirements for a master's degree.

Present A.F.S. Committee Reports

"Causes of Scab Defects" and *"A Study of the Workable Green Strength of Core Mixtures"* were reports of A.F.S. committees and were presented by, respectively, George F. Watson, American Brake Shoe Co., Mahwah, N. J., and Harry W. Dietert, Harry W. Dietert Co.

Third technical session the morning of May 4 was devoted to steel papers by E. J. Eckel, University of Illinois, Urbana, and S. J. Paprocki, Battelle Memorial Institute, Columbus, Ohio, by E. A. Loria, Mellon Institute of Industrial Research, Pittsburgh, and by J. F. Wallace and J. L. Martin, Watertown Arsenal, Watertown, Mass. Charles Locke, Armour Research Foundation, Chicago, and C. H. Lorig of Battelle, presided.

Mr. Eckel, in presenting the paper, *"A New Method*

for Determining Austenitic Grain Size of Cast Steel," described a procedure for measuring grain size based on the intergranular diffusion of bronze into steel at elevated temperatures. Results achieved are generally superior to those obtained by other methods, he said.

Delivering Mr. Loria's paper, *"Note on As-Cast Structure and Grain Size in Cast Alloy Steels,"* Mr. Locke described a new metallographic etching reagent and technique which brings out the as-cast austenitic grain size in steels which do not show ferrite outlining the original austenite grains.

Radial hot tears are the principal defects encountered, J. F. Wallace said, in presenting the paper, *"Prevention of Hot Tears in Thick-Walled Centrifugally Cast Steel Tubes."* He outlined the development of data which can be used in establishing a satisfactory casting technique.

The pattern round table luncheon was held at noon, May 4, with V. C. Reid, of City Pattern, Foundry & Machine Co., Detroit, leading the discussion on *"Shall Pattern Equipment be Machined or Cast to Size?"* Presiding was Leonard F. Tucker, City Pattern & Foundry Co., Inc., South Bend, Ind.; co-chairman was H. K. Swanson, Swanson Pattern & Model Works, East Chicago, Ind.

Simultaneously, graduates of engineering schools gathered for a luncheon presided over by C. J. Freund, engineering dean of the University of Detroit.

Business Meeting Features Hoyt Lecture

The Annual Business Meeting was held at 2:00 p.m., May 4. President W. B. Wallis made the presidential address (page 49, May issue) and presented awards to first place winners in this year's Apprentice Contest (page 50, May). Secretary-Treasurer Wm. W. Maloney announced officers and directors of the Society for 1949-50 (page 46, May).

Following the Annual Business Meeting John Howe Hall, Swarthmore, Pa., presented the Charles Edgar Hoyt Annual Lecture, *"Steel Castings in Welded Assemblies"* (page 49, May).

Only technical session held in the late afternoon of May 4 was sponsored by the Gray Iron Division. National Director-Elect T. E. Eagan, Cooper-Bessemer Corp., Grove City, Pa., presided and R. Schneidewind, University of Michigan, Ann Arbor, was co-chairman.

First of three papers was by S. C. Massari, A.F.S. technical director, Chicago, who reported a method of producing flake graphite of unusual fineness and favorable distribution from white iron in his paper, *"Graphitizing Behavior of White Cast Iron."* Following was a progress report on the A.F.S. Cupola Research Project by R. G. McElwee, Vanadium Corporation of America, Detroit.

Presents British Exchange Paper

Prof. Schneidewind presented the official exchange paper of the Institute of British Foundrymen, *"The Properties of Cast Iron in Relation to the Carbon Equivalent Value,"* in the absence of the authors, H. T. Angus, F. Dunn and D. Marles, all of the British Cast Iron Research Association, Birmingham, England. The paper reviewed earlier attempts to find a relationship between analysis and mechanical properties and included a diagram showing that the structure in sections up to 1.5 in. can be approximately predicted from the carbon equivalent.

Concluding gray iron shop course, held Wednesday evening, featured a panel discussion of *"Sources of Metal Losses in the Foundry"* by Alexander D. Barczak, Superior Foundry Co., Cleveland, N. L. Peukert, Carondelet Foundry Co., St. Louis, and Wm. C. Wine, Sibley Machine and Foundry Corp., South Bend, Ind. E. J. Burke, Hanna Furnace Corp., Buffalo, N. Y., presided and R. Hill, East St. Louis Castings Co., East St. Louis, Ill. was co-chairman. Mr. Barczak's paper, prepared for the discussion, will appear soon in AMERICAN FOUNDRYMAN.

Final sand shop course meeting of the 1949 Convention was held the evening of May 4 with F. S. Brewster, Harry W. Dietert Co., Detroit, presiding. Discussion leader was Herbert Schutzenhofer, Key Company, East St. Louis, Ill., who described construction methods, design and techniques for blowing cores in wooden

A.F.S. National Past Presidents and officials of the Society who attended the Past Presidents' Breakfast at the Missouri Athletic Club were, left to right: L. L. Anthes (1909), L. N. Shannon (1941), C. E. Hoyt, retired A.F.S. Executive Vice-President; Louis W. Olson (1925), Sheldon V. Wood (1947), Ralph J. Tector (1945), Wm. H. McFadden (1907), W. B. Wallis (1949), H. Bornstein (1938), Fred J. Walls (1946), Marshall Post (1939), G. H. Clamer (1924), W. R. Bean (1921-22), Secretary Emeritus R. E. Kennedy and A.F.S. National Secretary-Treasurer Wm. W. Maloney. Not in photograph was Max Kuniansky (1948).

W. Stuart Symington, United States Secretary of the Air Force, Annual Banquet speaker, and A.F.S. National President W. B. Wallis at pre-banquet reception.

boxes. His paper is scheduled for publication in AMERICAN FOUNDRYMAN.

At a joint gray iron and steel session, Wednesday evening, W. H. Johnson and W. O. Baker, Naval Research Laboratories, Washington, D. C., presented two colored motion pictures, *"Finger Gating"* and *"Step Gating."* Continuing the work on gating reported at last year's Convention, the authors presented data on economical production of sound castings.

Thursday morning Convention sessions were sponsored by the Gray Iron Division, the Steel Division and the newly reorganized Safety and Hygiene Committee. At the gray iron session, J. S. Vanick, International Nickel Co., New York, presided and Garnet P. Phillips, International Harvester Co., Chicago, was co-chairman. W. H. White, Jackson Iron & Steel Co., Jackson, Ohio, presented a paper, *"Growth and Scaling Characteristics of High-Silicon Cast Iron,"* of which A. R. Elsea, Battelle Memorial Institute, was co-author. The paper described a cast iron of approximately six per cent silicon developed to resist high temperatures. In cupola melting the charge contains about 6.5 per cent silicon and carbon near 1.4 per cent, he explained.

The Institute of Australian Foundrymen official exchange paper, *"Graphitization of Gray Cast Iron by Heat Treatment,"* was presented by the author, A. W. Silvester, Russell Mfg. Co. Pty., Ltd., Melbourne, Australia. Mr. Silvester described a detailed study of two gray cast irons made to determine the time to decompose combined carbon at various temperatures, and to compare the graphitization rate of a medium silicon and a high silicon cast iron.

The first closing-day steel session included *"Rapid Analysis of Acid Slags,"* by E. C. Zuppann, Wilson Foundry & Machine Co., Pontiac, Mich., and A. E. Martin, University of Minnesota, Minneapolis, and *"A Study of Insulating and Mildly Exothermic Anti-Piping Compounds Used for Steel Castings,"* by S. L. Gertsman, Canadian Bureau of Mines, Ottawa. E. Berry, Dodge Steel Co., Philadelphia, presided and Clyde Wyman, Burnside Steel Foundry Co., Chicago, was co-chairman.

Mr. Zuppann described a method for rapid quantitative analysis of acid slags by reflective spectrophotometry and explained how it could be used in control of acid steelmaking processes. Mr. Gertsman outlined a study of anti-piping compounds which led to the development of a means of evaluating such compounds.

At the safety and hygiene session, G. E. Tubich, Michigan Department of Health, Grand Rapids, presented *"Attracting and Keeping Good Men in the Foundry,"* and H. J. Weber, American Brake Shoe Co., Chicago, spoke on *"Industrial Hygiene in the Foundry."* L. C. Wilson, Reading, Pa., presided and co-chairman was J. R. Allan, International Harvester Co., Chicago.

Mr. Tubich presented some of the factors of safety and health in the foundry and pointed out that well-planned programs result in substantial reduction of accidents, of the incidence of occupational disease, of labor turnover and of absenteeism.

Good industrial hygiene is not nonsense, said Mr. Weber, in explaining that good health and safety measures are good business and a good investment. He detailed 11 specific steps the small foundry can take to stamp out occupational disease.

(Continued on Page 91)

A.F.S. McFadden gold medalists surround Donor Wm. H. McFadden A.F.S. National President in 1907, (center) at the A.F.S. Alumni Dinner. Left to right: Harry W. Dietert, Harry W. Dietert Co., Detroit; Carl F. Joseph, Central Foundry Division, General Motors Corp., Saginaw, Mich.; Gosta Vennerholm, Ford Motor Co., Dearborn, Mich.; Mr. McFadden; Past President H. Bornstein, Deere & Co., Moline, Ill.; H. M. St. John, Crane Co., Chicago; and Past President Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va.

RADIOISOTOPE GAGE

indicates liquid metal height in cupolas

Don M. McCutcheon
Supervisor, Applied Physics Research
Ford Motor Co.
Dearborn, Mich.

OPERATION OF FOUNDRY CUPOLAS on a high production basis imposes a severe handicap on the melter to maintain uniform metal composition. Fluctuations in the demand for hot metal must be met with adequate control on the operation of the cupola in order to maintain uniform analysis. In severe cases the conditions existing in the melting zone of the furnace may be affected, requiring special charging operations in order to restore the cupola to normal operation.

Additions or changes which are made in the normal charging schedule of a cupola will be reflected in the composition of the liquid metal which is tapped. These changes can be minimized if there is sufficient liquid metal in the furnace to provide a "fly-wheel" effect. It has also been stated that any ladle additions would be much more effective if the composition of the molten metal from the furnace could be held within closer limits.

One very effective means of increasing the amount of liquid metal in a cupola in order to stabilize composition is to add a forehearth. Although the use of a forehearth has many advantages, its high additional cost and increased space requirement may not warrant its use. This article is largely concerned with cupola operation where the use of a forehearth is not economically justified or space limitations prevent its addition.

Improvements in the operation of a cupola, which is used on high production operations, are largely determined by the amount of information which the melter can obtain on the conditions within the furnace. Information on the depth of liquid metal in the furnace would be of distinct advantage, particularly in maintaining uniform composition.

An inquiry from the company's production foundry to the research department simply asked if some means could be devised to monitor the height of liquid metal in production cupolas. Consideration was first given to the possibility of including electrodes in the lining of the furnace which would make or break an electrical circuit as the metal lowered or raised during the pouring and make-up cycle.

Several unsuccessful attempts were made to use carbon electrodes inserted in the lining of the cupola. Occasionally electrical continuity would be obtained at the start of a run, but eventually electrical contact failed. The exact reason for the failure of electrical contact was not determined, but it was observed that the carbon electrodes were severely attacked during the few runs made.

It was suggested at the beginning of this investigation that some attempt should be made to use a penetrating radiation which would pass through the entire cupola and be measured on the opposite side. This would not require internal installations and would therefore not be affected by the operation of the cupola. The first cost would be high, compared to a simple electrical type of circuit, but the maintenance problems would not be serious.

Radiation Gages Using Radium

There is considerable literature on the use of radium in the development of gages, particularly for liquid level height indication in the chemical process industry. Several commercial instruments are available using a small radium source for measuring the thickness of metal or for gaging heights of liquids in closed vessels.

In the chemical industry it is possible to actually float the radium in a sealed container on the top of the liquid and determine the liquid height by measuring the intensity of radiation reaching a Geiger counter tube on the top of the vessel. There is very little absorption in the path of the radiation in an installation of this type, so that the cost of the radium required is low.[1]

An alternative arrangement is possible with the radium gage where the use of the float is not suitable. Advantage is taken of the scattering power of various materials when bombarded by gamma radiation. By placing a small radium source on the side of a tank.

A method for continuous indication of the liquid metal height in foundry cupolas has been developed. Use is made of the radioisotope cobalt 60 to provide radiation having sufficient penetration to be detected by Geiger counter circuits after passing through the cupola above the liquid metal level. Variations in the design will permit the indication of a single level, multiple levels, or a continuous indication of the liquid level at all times during the melting and pouring cycle. Safety features have been included in the design of the gage to make it suitable for production departments. Patent rights to the system are held by the Ford Motor Co.

the amount of radiation which is scattered back is measured on a sensitive detector adjacent to the radium source.

In this installation, the direct rays from the source are blocked off from the detector by a heavy lead shield so that only the scattered radiation from the tank is detected and measured. When a liquid in the tank rises to the level of the source, an increase in radiation scattering occurs and is indicated by lights or alarm bells.

An examination of the construction of a cupola will show that the radiation penetration problems are rather severe, compared to the usual liquid reservoirs

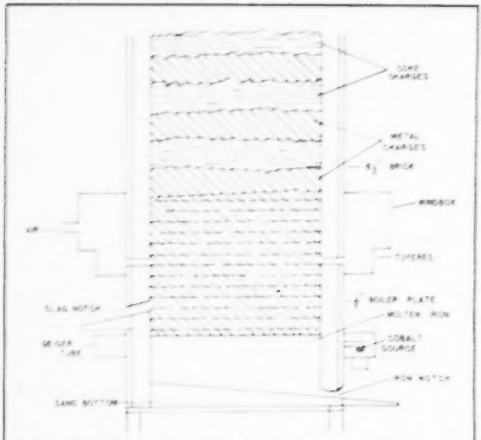


Fig. 1—Sketch showing the location of the radioisotope gage on a small cupola, for indicating when the maximum liquid metal level has been reached. Vertical heights are exaggerated in this sketch.

or pressure vessels used in the chemical industry. The scattered radiation type of device did not seem adaptable to the complex wall structure of a cupola.

Preliminary experiments were made with a 5-milligram radium capsule to determine whether penetration could be obtained through the entire cupola above the liquid level zone. The results indicated that a much stronger radiation source would be required to secure a usable intensity after passing through the cupola. The cost of a strong radium source was considered prohibitive, so that consideration was given to the possibility of using a radioactive isotope.

Radioisotopes Investigated

Examination of the list of radioisotopes[2] available from Oak Ridge reveals that there are a number of high energy gamma emitters which may be considered. A high energy emitter is required in order to obtain sufficient penetration through the complicated structure of the cupola and still have sufficient radiation left to actuate a sensitive detector placed on the opposite side.

The life of the isotope and its relative cost are also factors which must be considered in the selection of the radioisotope. Cobalt 60 was chosen as representing a good compromise of all these factors. Its radiation exceeds one million electron[3] volts, and its life is considered adequate, falling to half its original intensity after 5.3 years.

Cobalt 60 radioisotope is a gamma emitter and may be considered as having approximately the same penetrating power as a 2-million volt x-ray machine. The radiation emitted by cobalt 60 differs from the radiation emitted by radium or commercial x-ray machines, because of the essentially monochromatic character of the rays.[4]

Where heavy absorption conditions exist, as occurs in passing through the body of a cupola, it is desirable to have as much of the radiation as possible reach the Geiger counter detector without having an excessively strong source. When a source of radiation is purchased on the basis of its activity, the absence of any soft or low voltage equivalent radiation makes cobalt 60 a highly efficient source for the cupola application.

Experimental Gage Using Cobalt 60

The original discussion with the foundry metallurgists had indicated that a gage which would indicate the safe full limit of the production cupolas would be sufficient. Later, this request was modified to include an indication of the low-level operating point.

Preliminary work was carried out to determine the possibility of indicating the cupola liquid metal level at one fixed position. From this data calculations were made which indicated the requirements for a gage which could indicate the liquid level at any number of points or, if necessary, continuously monitor the level at all times.

An experimental radioisotope gage was built to determine the feasibility of indicating when the cupola

Fig. 3—Pilot model installation of radioisotope gage for indicating liquid metal levels in a cupola. Electronic controls and indicating light panel are mounted on the girder at the right.

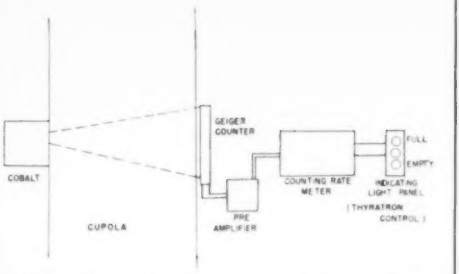


Fig. 2—Schematic diagram of a complete radioisotope gage for indicating liquid metal level in a cupola. Three lights are shown for indicating empty, half-full, and full cupola well.

well was full of liquid metal. Figure 1 shows a sketch of a small cupola and indicates the approximate position of the cobalt 60 source in its safety container, with the Geiger counter chamber mounted directly opposite. With a 20-millicurie source of cobalt 60, exploratory tests with a portable Geiger counter indicated that some radiation was penetrating the cupola body above the liquid metal. A more elaborate counting-rate meter was used to determine the actual number of counts above background.

Accuracy Limits

A Geiger counter instrument indicates individual pulses of radiation which reach the Geiger tube and does not discriminate between cosmic radiation or radiation from the cobalt 60. The background count resulting from cosmic radiation is determined by the locality and the size of Geiger counter tube used. It is possible to work with radiation intensities only slightly above background if accuracy and time are not essential. For accurate quantitative and reproducible results, a counting rate of 100 times background may be desirable[5], depending on the probable error required.

Where radiation is used solely for indicating purposes, as in the cupola gage, the limits of accuracy required are determined largely by the speed of response desired and the number of indicating elements which must be actuated.

Experimental results show that where only one liquid level height is to be indicated, very low levels of radiation can be used. For example, a count of twice background will give a consistent indication of liquid level if a delay in response of at least 30 sec. can be tolerated. The delay time is determined by the electrical constants used in the rate circuit of the Geiger counter unit.

The following factors summarize the requirements for a cupola gage:

1. The delay time of response for signalling when a particular liquid level has been reached is inversely proportional to the number of counts (intensity of radiation received).

2. The number of counts received must be increased in proportion to the number of liquid levels which must be separately indicated. (This does not apply to continuous monitoring of the level where the counts required will be approximately equal to that required for one signal indication.)

3. Adjustments of electrical and mechanical components are less critical if the count received can be made ten times the background or more.

4. In order to obtain maximum safety protection for production personnel, the size of the source used must be as low as possible and still satisfy the above listed requirements.

Figure 2 shows a schematic diagram of a multi-indicating cupola liquid level gage. The output from the counting-rate meter is fed into a bank of thyratron-

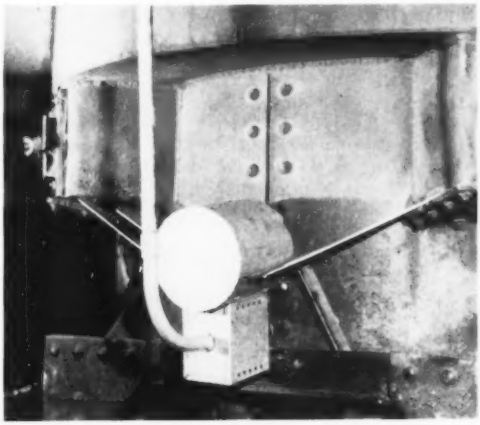


Fig. 4—Radioisotope source, attached to the cupola, showing the construction of safety shield and housing for the solenoid, which controls the position of the cobalt 60 in the lead shield.

controlled lamps. A given indicator lights when the voltage output is correct for triggering a particular thyratron. In this installation, two indicating lights are used to locate specifically the full and empty condition of the cupola. The middle light indicates approximately a half-full cupola and serves the purpose of indicating the rate of rise of liquid metal after tapping.

In the sketch of Fig. 2 it should be pointed out that the Geiger counter detector tube extends over the range of the cupola well from full to empty. The effect of rising metal in the well is identical with the action of drawing a window shade to gradually reduce room illumination. The potential output of the counting-rate meter to the thyratron control for this installation varies uniformly with metal height* and has approximately a 2:1 ratio (i.e., an empty cupola gives twice the output voltage of a full cupola).

A pilot installation on a small 60-in. cupola in the Ford Motor Co. jobbing foundry is shown in Fig. 3.

*Slag which forms on top of the liquid metal is held to a minimum and therefore does not seriously affect the operation of the gage.

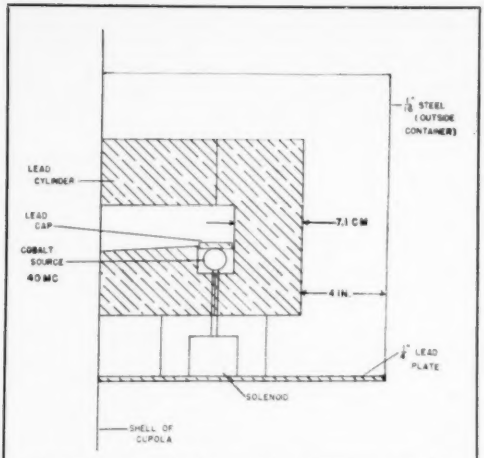


Fig. 6—Sketch of lead protection chamber, showing the details of the solenoid-operated safety well which houses the cobalt 60 when the cupola is not operating.

dicating gage to the foundry metallurgist seems to give sufficient information for their use, and a production foundry installation is nearing completion.

Considerable thought has been given to the problem of placing radioactive sources in the vicinity of production personnel. So much publicity has been given to the hazards of radioactive substances that extreme precautions must be taken to reduce the radiation hazard in any actual installation. A procedure is being followed at this plant which is more than adequate for personnel protection.

Three groups in the organization are expected to cooperate in the final design of the installation. The applied physics staff will supply the basic design and make the necessary radiation tests, using accepted standards[6, 7]. The industrial health unit will approve the design and supervise the installation; and finally, foundry supervision will advise on the design and make the installation on the production cupola.

Calculations were made to determine the amount of lead which must be used to house the cobalt 60 radioisotope. An additional barrier is provided by a shell of steel which surrounds the lead block, providing an adequate distance safety factor. The lead

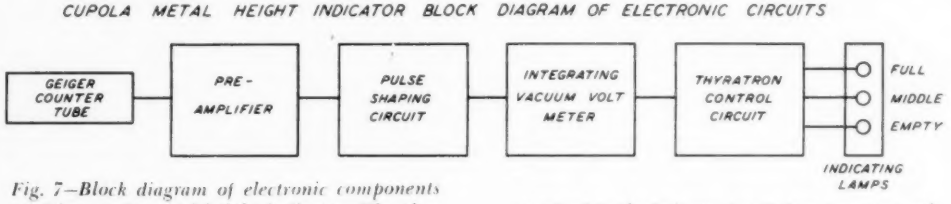


Fig. 7—Block diagram of electronic components used in cupola metal height indicator. The electronic circuits within each block, with the exception of the thyratron control circuit, are standard in the industry for Geiger counter work. Circuit details may be obtained from the literature, or will be supplied by the writer on request.

The radioisotope cobalt 60 in its protective housing is shown on the left side of the cupola just below the tuyere. The Geiger counter chamber is shown opposite, mounted on the right side, with electrical conduit leading up to the electrical controls and indicating lamps on the steel girder. Figure 4 shows a close-up of the radiation-source housing, and the Geiger tube cabinet and electrical controls are shown in Fig. 5.

The Geiger counter tubes used in this particular installation and illustrated in Fig. 5 were borrowed from an x-ray diffraction machine spare stock and are not long enough to cover the full depth of the wall of this cupola. Special tubes are being designed and built for a production foundry 84-in. cupola installation. Fig. 2 illustrates how this tube, which is 18 in. long, will be mounted on the cupola.

Mention was previously made of the possibility of continuously monitoring the cupola liquid metal height, and designs to accomplish this were worked out. However, a demonstration of the three-light in-

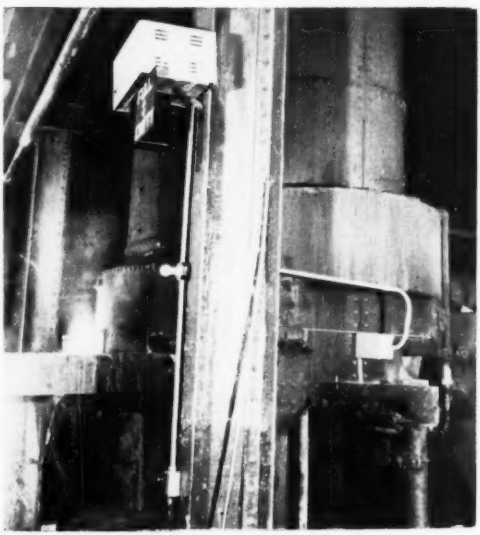


Fig. 5—Geiger counter tube housing mounted on cupola directly opposite cobalt-60 source shown in Fig. 4.

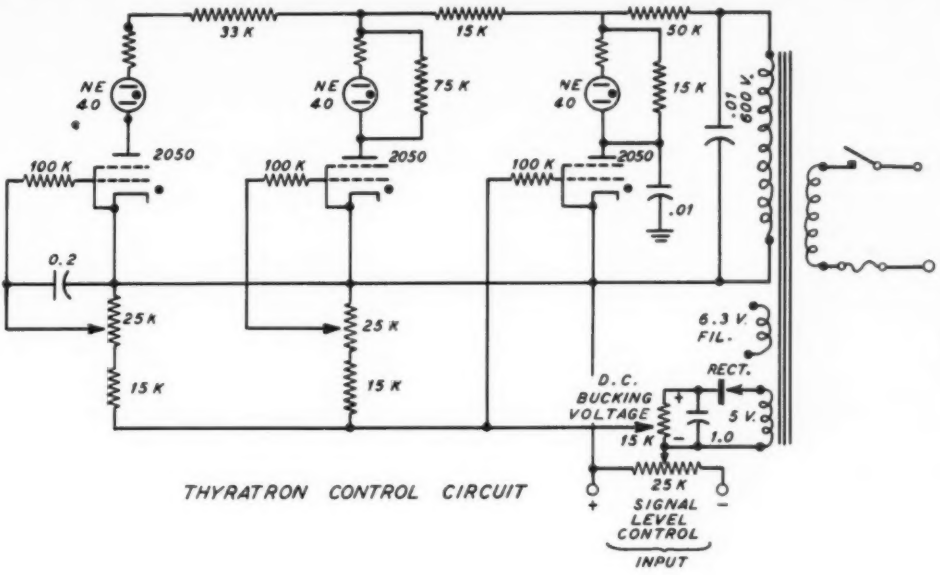


Fig. 8—Thyratron control circuit used for indicating the full, medium, and empty position of the liquid metal in the cupola. Neon lamps were used in this installation, as the intensity of the glow varied over a narrow range of input signal. This was useful in indicating when the required level was being approached. Relays can be substituted in this circuit to give a positive position indication.

block is designed to fit closely against the side of the cupola shell. A one inch diameter opening in the lead block on the cupola side allows a moderately collimated beam of radiation to pass through the cupola. Figure 6 illustrates the design adopted for this installation and shows how the cobalt 60 capsule automatically drops into a safety well when the gage is not in use.

Precautions had to be taken to automatically block off the radiation from the cobalt 60 whenever the cupola is shut down for repairs or relining. Workmen entering the inside of the cupola will be adequately protected, as an electrical interlock system automatically cuts the electric current off the solenoid which supports the radiation source during normal use.

When the electrical circuit is broken either by opening the bottom of the cupola or failure of electric power, the cobalt source automatically drops by its own weight into a recessed well in the lead block, thereby preventing any radiation from entering the cupola. Radiation leakage tests are made with sensitive survey meters after each installation of this type, as a final check before operating.

Conclusion

A radioactive isotope gage using cobalt 60 has been described for indicating the level of liquid metal in a cupola. A unique design of the lead container for the radioisotope automatically provides radiation safety when the cupola is not in use. The operation of the pilot model described in this article meets the requirements of the production foundry, and an installation of an 84-in. cupola is nearing completion. A report on the performance of this cupola will be made at a later date.

Acknowledgments

The author wishes to thank the operating groups in the jobbing and production foundries of the Ford Motor Co. for their encouragement during the development of this gage. S. G. Knoch and J. Stone developed the electrical controls, and S. B. Miller and W. Reid, of the applied physics staff, carried out all the experimental tests in the foundry.

References

1. L. S. McCaslin, Jr., New Invisible Eyes, *The Oil and Gas Journal*, pp. 100, 101, 118, 121, Oct. 25, 1947.

2. Radioisotopes, Catalog and Price List No. 2, distributed by: Isotopes Branch, U. S. Atomic Energy Commission, P. O. Box E, Oak Ridge, Tenn.

3. D. M. McCutcheon, Experimental Work Employing Radioisotopes Cobalt and Selenium, A talk presented at Annual Meeting of the Society for Nondestructive Testing, Philadelphia, Oct. 1948.

4. G. T. Seaborg and I. Perlman, Table of Isotopes, *Review of Modern Physics*, vol. 20 (4), p. 595, Oct. 1948.

5. L. J. Rainwater and C. S. Wu, Applications of Probability Theory to Nuclear Particle Detection, *Nucleonics*, vol. 1, no. 2, pp. 60-69, Oct. 1947.

6. American Standards Association, Z54.1, 1946. Safety Code for Industrial Use of X-Rays.

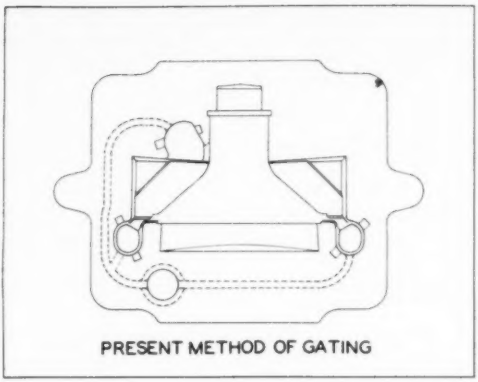
7. Gamma-Ray Shielding Data, *Nucleonics*, vol. 3, no. 4, Oct. 1948, pp. 44-45.

MODERN FOUNDRY METHODS...

In a paper presented at the Ohio Regional Foundry Conference, sponsored by the A.F.S. Ohio Chapters, in Columbus, Mar. 12, 1949, Harold G. Sieggreen, chief process engineer of the Central Foundry Div., G.M.C., Saginaw, Mich., discussed the factors which must be considered before procuring pattern equipment for use in a high production malleable foundry.

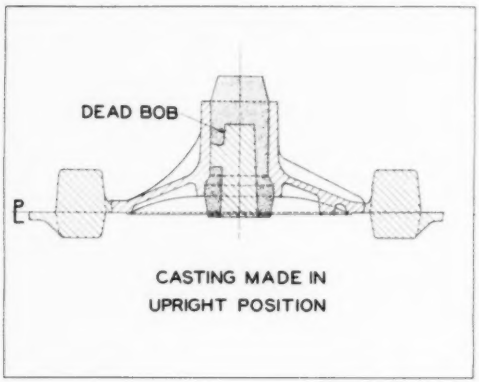
Engineering departments, whose function is to coordinate the experience of the various department heads into the design of pattern equipment, have been established in plants of the author's company. All patterns, core boxes, and driers are drawn up in full detail.

Each part is studied with respect to placement of the parting line, position of gates, most practical type of pattern equipment to use, and whether any casting design changes should be requested. Also considered are the yield, scrap, gate removal, number of cores needed, amount of finish stock and draft required, and whether a straightening die will be needed.


PRESENT METHOD OF GATING

A differential carrier casting (left) had four live feeders at the flange and one blind feeder in the core. Effectiveness of the blind feeder seemed to vary, and removal of the gate from inside the casting also presented a problem.

A similar casting (above) is shown parted in a different plane. Also, the new method has only three gates, all easy to remove. The outside gate at the heavy section where the tube intersects the bowl is now fed by live iron. An added advantage is that all three gates are at the same level in the mold.



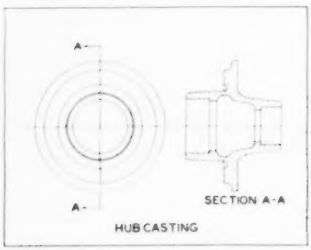
CASTING MADE IN UPRIGHT POSITION

A slight change in design will often permit of simpler and more economical gating. In the front wheel hub casting (below) the flange may be thickened in areas by round bosses, or it may have a ring built up on it, as shown.

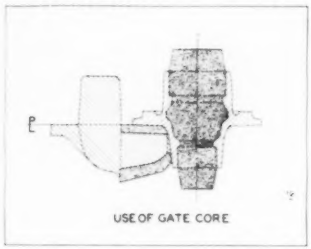
Note that the extreme outside diameter of the flange is too thin for gating purposes. There is no simple way to gate this hub and still produce a sound casting. Adding a pad to the flat face of the flange will take care of the shrink, but results in a difficult snagging operation as this type of pad must be completely and accurately removed.

The gate core method (below) was often used with the hub casting. This method is not desirable because of the low yield, additional coring, and cracking of the casting above the gate core. Also, the gate position is not ideal from a removal standpoint.

The sketch below shows what can be done if the customer allows a pad to be placed on the boss or ring side of the flange. The gate may then be placed at this pad. A pad on the opposite side of the casting may be necessary for balance. The gate has now been placed in an ideal position for a fast shearing operation. Appearance of the casting is also improved by elimination of the scar caused by a gate core.



HUB CASTING

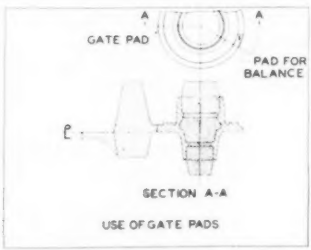


USE OF GATE CORE

⬆ *Gate core method of gating the hub casting.*

⬅ *Sketch showing section of hub casting and difficult gating problem.*

Gate pads placed on ring side of ➡ *the flange solve the problem of gating the hub casting.*

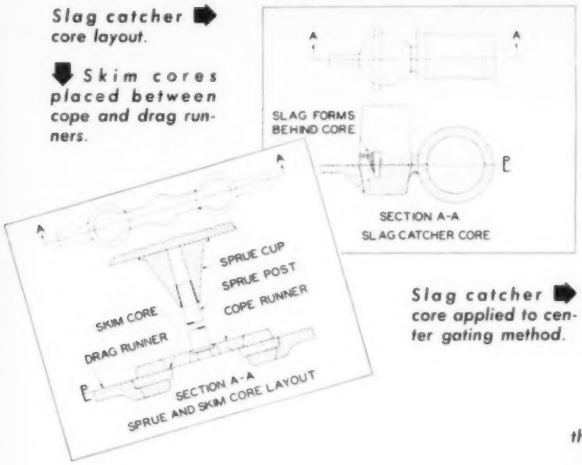


USE OF GATE PADS

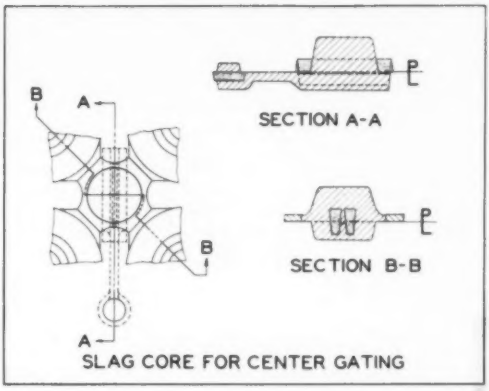
...MODERN FOUNDRY METHODS

Slag catcher ➡ core layout.

⬇ **Skim cores** placed between cope and drag runners.



Slag catcher ➡ core applied to center gating method.



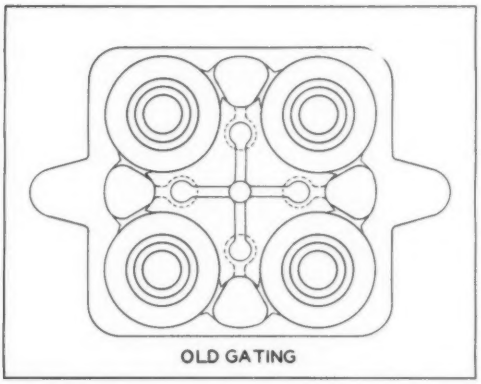
A skim core in the drag directly under the sprue usually is not fully effective in trapping slag. A skim core in the sprue basin can be used to good advantage if the castings in that particular mold are not prone to misrun. Chokes in the runners are often used to catch slag floating on the iron, but experience has shown that this method is not as efficient as the use of a skim core in the sprue basin at the top of the cope mold.

A popular layout for skim cores places them between cope and drag runners (above). Note that the iron is carried by cope runners about 3 or 4 in. from the sprue and then strained through skim cores into the drag runners.

When it was found that many of the heavier jobs continued to show high scrap losses in spite of the various skim core positions tried, and that the slagged areas were always at the gate, the foundry developed a slag catcher core (above, center).

A core print is placed in the feeder about two-thirds back from the gate. The flat slag catcher core is placed in this print with the bottom of the core extending below the gate level.

Application of a slag catcher core to the center gating method is shown in the sketch (above, right). As the central feeder has four gates attached, it was necessary to design a special channel-shaped core for this application.

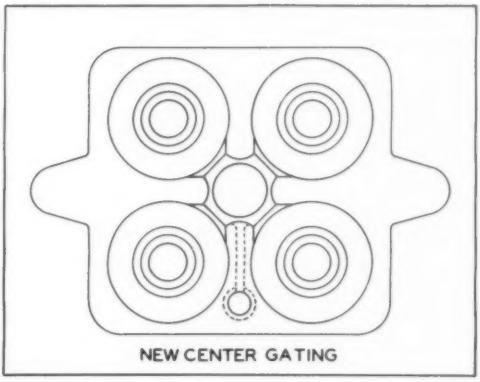


Foundrymen often fail to realize that many current jobs present enormous possibilities in improved gating. This is especially true if the part has not caused trouble from scrap, customer's complaints, or cumbersome foundry operations.

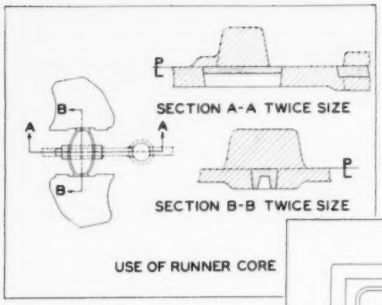
Front wheel hub castings had been made with two gates (above) for several years. These were laid out four to a pattern plate, and with four feeders, four runners, and four skim cores (skim cores indicated by dotted circles).

After an investigation of gating practice on this type of hub casting, it was found that not only could the casting be made with one gate, but also that only one feeder was necessary. This feeder was placed in the center recess between the four castings, and a short runner was extended to the sprue position near the edge of the flask (below).

Although it may be possible to sprue directly into the top of the feeder, the foundry decided that the use of a runner between the sprue and the header provides for more effective flow and slag control.



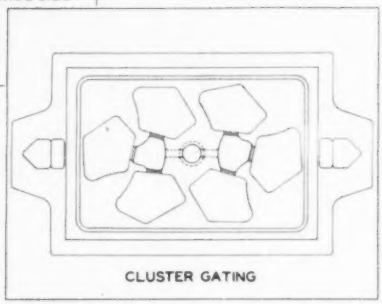
MODERN FOUNDRY METHODS...

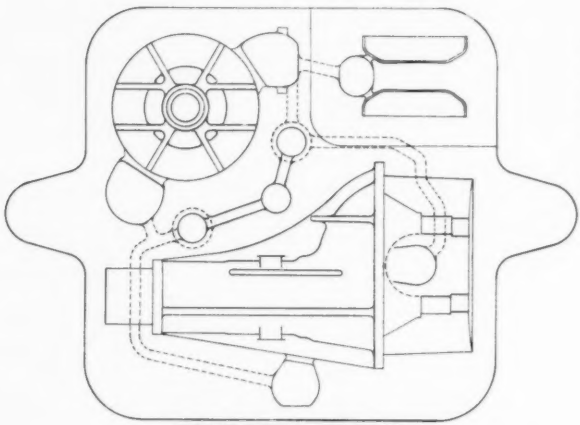


Patterns should be gated to permit equal distribution of metal. Slag and misruns will result from gating which does not permit the iron to be kept in motion. Insufficient thought was given to these two important principles in past years. Many equipments were laid out with the patterns placed in neat rows on the pattern plate. Iron had to pass through the feeders near the sprue to get to the other feeders. The castings near the sprue would fill to approximately the parting line level and then remain partially filled while the iron ran into other castings. After the iron in all the cavities reached this level, the flow would uniformly fill all castings. However, the interruption at the castings nearest the sprue will often result in scrap because of slag. They also may misrun because of cold metal.

If it is not possible to reposition the patterns on the plate or impractical to buy a new pattern equipment, a core can be added to each of the feeders where this condition occurs. The runner core, as it is known, is also channel-shaped (left, top). Core prints on both sides of the feeder allow it to be placed entirely in the drag mold in direct line with the runner. No iron enters the center feeders until it reaches the castings placed farthest from the sprue.

Although the method just discussed is effective, it is more desirable to position the patterns properly for equal distribution. There are many ways of doing this. Often the castings can be grouped in clusters of three (left).



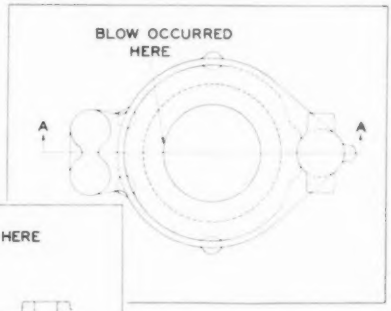


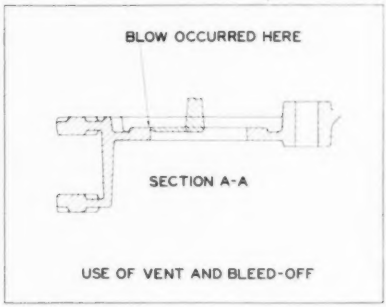
COMPOSITE GATING

It is often advantageous to place different types of castings in the same mold. The sketch (above) illustrates how this system tends to utilize all of the available flask area, which is of special importance in foundries where an attempt is made to standardize flask sizes. The output per molding station and the yield have been increased, and the number of pattern changes decreased. Each mold of the type shown furnishes the proper number of malleable castings to make one passenger car rear axle.

Iron poured over a green sand "hump" in the drag usually is troublesome as the cavity fills up faster than the gas can escape. The brake spider casting (below) illustrates such a condition. The gas could not escape rapidly enough to prevent blows in spite of the fact that there was a large circular opening in the center of the casting.

The sketch (left below) shows how the brake spider was vented to overcome the blow condition. A thin runner was used to transmit the gas to a round vent in the center of the opening. A vent pin of a smaller diameter was placed on top of the one shown to carry the gas through the top of the cope mold. This arrangement completely eliminated scrap because of blows on this casting.





FOUNDRY EXHIBIT HIGHLIGHTS NAVY PIER ILLINI OPEN HOUSE

Charles Fausel
Foundry Laboratory
University of Illinois
Navy Pier, Chicago

FOCAL POINT OF VISITOR INTEREST at the University of Illinois Navy Pier Branch's Open House, held in Chicago April 26, was a six-hour demonstration of foundry operations put on by students and instructors of the University's Foundry Department. Thousands of visitors witnessed molding, coremaking, melting, pouring and all the varied operations that comprise the art of metal casting.

Upon entering the classrooms, visitors were first directed to the molding department, where students gave informal discussions of their work as they made molds, using loose patterns and matchplates. Following this was a short discussion on machine molding and sand conditioning.

Of primary interest was the pouring department where visitors watched non-ferrous melting in a gas-fired crucible furnace and ferrous melting in a top-charge, three-phase electric arc furnace. Heats of aluminum were poured from the crucible every half hour, while molten iron was tapped from the electric furnace at 90 minute intervals. An overflow crowd witnessed each tapping of the furnaces.

Following this, castings shakeout was demonstrated and sand was put through the acrator and redistributed, after proper conditioning, to the molders.

After this phase of the tour, the guests passed into the pattern and tool room and the core room. Prior to entering the core room, the visitors were given aluminum frying pans or ash trays as souvenirs and registered for door prizes—copper-plated iron book ends cast by the students.

Following a brief discussion of cores and coremaking, demonstrations were given on the hand ramming of cores. An intricate, small core was then blown on a floor type coreblower to illustrate the difference in time required between blowing the core and ramming it by hand.

A display on stack core molding was the next exhibit. Molds were made up for making gear blanks for the University's Machine Shop. Four blanks were in a core, and these were stacked 10 deep. Also displayed were a green core, the same core after baking, and a cutaway section of the stack, showing head, sprue, gate and core mold cavity. Making of these cores was demonstrated on a jolt-rollover-draw machine. These cores were then put into a gas-fired, thermostatically-controlled core oven, and the principles of core baking were explained.

Demonstrations of sand testing apparatus and techniques and metal hardness testing, concluded the Foundry Department's exhibition.

In charge of the exhibit were Robert E. Kennedy, head of the Navy Pier Foundry Department and Secretary Emeritus of the American Foundrymen's Society; Professor Roy W. Schroeder, chairman of the A.F.S. Apprentice Contest Committee; Glenn Cramer, instructor in Pattern Design; and Wayne Wright, foundry laboratory assistant. Students who participated are College of Engineering sophomores.

(Above) Professor Roy W. Schroeder, right, measures temperature with an optical pyrometer as students receive metal from the University's electric furnace.

(Below) Examining souvenir ash trays cast at the exhibit for presentation to visitors at the Open House, University of Illinois, Navy Pier, Chicago.

FRICTION SAW CUTS CASTINGS CLEANING COST

H. J. Chamberland
Research Engineer
The DoAll Co.
DesPlaines, Ill.

FRICTION CUTTING of gates and risers by the band saw method is an art dating back many years, and foundrymen of the old school endowed with foresight fully realized its potentialities. While the sparking effects were brought out, the process was more or less deceptive because both the machine and the cutting tool lacked the essentials which today make the technique one of wide industrial acceptance.

Since friction cutting by the band saw method has been placed on a practical basis, much has been written on the subject and claims have ranged from one extreme to the other, with many intermediate points open to debate. It is well to bear in mind that a test which appears to be reliable in one case can prove a failure in another due to such variables as design of machine, quality of saw band and dexterity of the operator. Likewise, technicians with years of training along these lines often accomplish feats which can seldom if ever be duplicated in field practice.

Because high speed band saws, either for actual cutting of nonferrous metals or friction cutting the toughest steel alloys, can now be selected on the basis of individual requirements, the resulting lower costs now place this type of equipment within the reach of even the smallest specializing foundry.

Long before the introduction of high-speed machines, precision saw bands already had been developed to a point where they were capable of velocities as high as 15,000 fpm and were cutting efficiently alloy steels of 12 to 18-in. thickness at then standard speeds.

Techniques Differ

The difference between "high velocity" sawing and "friction" sawing should be definitely understood because the techniques have nothing in common. With the high velocity technique the cutting action is similar to low or conventional speed procedure. In both cases, the fundamental law of chip production that friction generates heat and heat destroys temper predominates. Furthermore, materials in the high velocity category may be cut to full machine height capacity and heat is kept at a minimum by the application of the proper saw control factor to suit the thickness and hardness of material.

Most steel alloys are within the low melting point range and lend themselves to the friction sawing process. Hardness is not a determining factor so long as the steel or alloy being cut is within the low melting point range. With reference to materials other than steel, some only char when heat is applied. Others, which fall into an extremely low melting range, soften and become sticky, adhering to the saw blade and side walls of the finished cut. Neither type of material falls into the friction sawing category.

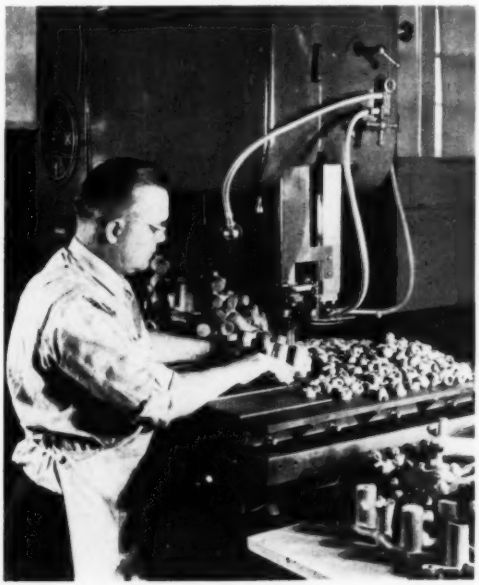
Most of the questions propounded by those interested in adapting friction sawing to their own uses have been answered adequately, first in laboratory tests and later in production achievements. One of the commonest is this—"Does friction sawing require a special type of band and, if not, how can a regular hardened-tooth saw band stand the excessive heat generated by friction?" It is a logical question and requires a logical answer. Regular standard-pitch bands are used for friction sawing, provided they are of the highest quality, with tooth hardness depth extending exactly to gullet line to allow maximum flexibility of tooth under severe strains.

Width of bands varies from ¼ to 1 in., but the widest band consistent with radius or contour being sawed should be used. For straight cutting, blades 1 in. wide are preferred. Pitch must be neither too fine nor too coarse. Depending upon thickness of material to be cut, 10, 14 and 18-pitch saws have been found to give maximum tool life.

Rapid Heat Dissipation

As to the questions of the effect of heat generated in the saw teeth, the fact remains that the section of the blade doing the actual cutting is only in contact with the material being cut for an infinitesimal part of a second; hence, the small amount of heat generated is readily dissipated as the 255-in. blade revolves around the 36-in. wheels at approximately 3 miles per minute on the thicker cuts.

Heat penetration into the side wall of the finished cut is almost negligible, slightly increasing in depth



as thicker materials are cut. Cutting rates are slower on thicker sections, and the opportunity for greater heat penetration is present. Heat penetration, due to friction sawing, is inherently less than that produced by flame or torch cutting.

In general, only two effects of heat penetration can be found when cutting ferrous metals that respond to heat treatment. In the case of untreated materials that respond to air hardening techniques, that material immediately adjacent to the cut will be found to have an extremely thin skin hardness due to the temperatures reached by friction. Since the material in this case responds to air quenching, the air entrained in the rapidly moving saw cools the material rapidly enough to cause minute skin hardness that can be detected only by the time-honored file test, since the zone of hardening is so thin that the usual hardness testers do not give measurements.

Heat Distortion Avoided

Behind this zone of hardness will be found a very narrow annealed area, so small that in all cases it is not objectionable. In fact, on those jobs where heat distortion due to machining is a problem, friction sawing will do an excellent job. In the case of heat-treated materials, those that do not react to air quenching, only a very narrow zone of annealing will be found, similar to that previously mentioned.

Tooth sharpness is not a controlling factor but may be a drawback to sawing by friction. A new band reaches its maximum efficiency only after some 20 min of cutting, or until the teeth are sufficiently "dulled" to create the higher temperatures necessary for maximum friction cutting.

Only after repeated laboratory tests and careful consideration given all exterior factors likely to be involved are recommendations made, and these are definitely dependable and can be repeated in industrial fields. Most important to foundry production keymen is the amount by which the friction cutting process can increase their output or reduce their cutting costs. One objective of this article is to consider typical field applications and the procedures which made them possible, and the following diversified data should serve that purpose.

Traveling at 15,000 fpm, the friction cutting band saw trims a ¾-in. section on this tough armor plate casting at a rate of approximately 14 lineal in. per min.

The following points should be made clear: (1) A material thickness of one inch is considered the maximum for production friction sawing by this method. However, sections up to 1½ in. may be so cut provided the casting is of a nature to be slightly rocked vertically to automatically present a continually thin

In 9½ hr operation approx. 2900 lb of ferrous castings of the type shown are friction cut with this saw.

Cutting gates and risers from tough silicon alloy castings. The average cut is ½ in., and the time per cut is 6 sec with a saw velocity of 10,000 fpm.

Stainless steel, one of the most severe materials on any type of cutting tool, responds readily to the high speeds of the friction band. In cutting gates from stainless steel castings, as in this case, the experienced operator may cut sections up to 1½ in. thick.

material section to the saw. (2) Hardness means nothing, but the alloying constituents do and have considerable bearing on the saw speed needed to create the most frictional heat in the least possible time. (3) The friction band will last approximately 6 hr on the thicker cuts and as much as 3 days on sections under ½ in. thick. A reasonable contour can be generated with ease, and the band will not break when subjected to a reasonable amount of accidental twisting. These factors are responsible for low cutting tool costs as a whole as related to gates and risers, and material economy also is a factor because of the narrow saw kerf and closer cutting.

It is fitting to start with stainless steel applications because this material is as difficult to cut as any cast metal. Cutting rates are substantially higher for the less resisting materials which more readily respond to the high and super high velocities of the band.

Apply Proper Saw Speed and Pitch

Many foundries specializing in stainless steel assume that any gate or riser section under one inch thick will cut efficiently at a standardized velocity of 12,000 fpm. This applies to uninterrupted and to diversified production where time lost in raising or lowering speeds to suit varying thicknesses could hardly be compensated by increased cutting rates. However, for extensive runs on a particular design it is profitable to apply the proper velocity and saw pitch. The cutting rate on gates and risers is estimated in square inches per minute or fraction thereof per cut. Stainless sections from 1 to 1½ in. thick also cut well at 12,000 fpm if the rocking technique is used.

An average cutting rate of 8.5 sq. in. per min is regularly being maintained on cutting stainless steel sections. A 1½ x 1½-in. cut requires 1.53 min, a ⅞ x ⅞-in. cut only 0.62 min, and the time is gradually reduced to only a few seconds to slice through sections under ½ in. Friction sawing of all gates and risers is accomplished with a 1 in., 10 pitch precision saw band having a raker set of 0.057 in. This wide set affords the maximum of side clearance which is most important to friction cutting. However, this clearance can be preserved only if proper depth of tooth hardness is achieved through correct heat treatment of the band. Not all saws intended for conventional cutting of metals will resist the severe strains to which they are subjected under friction sawing conditions.

Castings 5 in. in diameter, with 3 gates and risers

Friction sawing on these castings proved to be three times as fast as previous methods used. Note wood block used by operator to provide maximum work pressure and keep right hand at safe distance from saw.

on each, might be considered a common stainless steel application. The material is an 18 per cent chromium, 8 per cent nickel alloy, and this type cuts rather freely with only slight heat penetration to the surface of the finish cut. Any awkward location of the gates may be counteracted through the use of some proper supporting means, such as a wood block to hold the casting steady while the center riser is being removed. The thickness in this case was ½ in. with a total cutting time of only 0.78 min per casting.

Heavy and uninterrupted work feeding pressure is imperative in friction sawing. Only thus can the high speed saw generate the required heat for rapid cutting. Use of a hydraulic feed expedites the cutting action and relieves the operator of fatigue and is recommended for all friction sawing operations when quantity makes it permissible. Work-holding fixtures of quick-clamping action type can usually be shopmade.

Armor plate castings rank next to the stainless as hard-to-cut metals by any method, yet ¾-in. plate cuts at a rate of nearly 14 lineal inches per minute with a saw velocity of 9000 fpm. Saw life is somewhat shorter than when friction cutting most steel alloys.

Silicon monel metal gates and risers can be friction sawed most efficiently if the thickness does not exceed ¾ in. The correct saw velocity is 7000 fpm for the ¾ in. and thinner sections. Technicians claim that heat dissipation is too rapid to cut sections over ¾ in. However, use of the process can be extended by redesigning the castings or using different sized gates and risers which are within the material thickness limitation allowed.

Another common friction cutting operation is that on manganese steel castings. Sections under ½ in. thick cut well at 10,000 fpm, and thicker sections at 12,000 fpm. Manganese steel gates up to 1½ in. thick may also be cut by the rocking technique. Cutting rates vary with the analysis, 3.5 to 5.5 sq. in. per min being average production.

Another material which lends itself readily to the friction sawing process is vitallium alloy. A foundry cutting a considerable amount of this material makes the following data available, with heads and risers as the applications:

	Min
5/16 x 1½ in. oval	0.06
½ in. dia. round	0.06
½ x 2 in.	0.25
¾ x 1¼ in. pear shaped	0.17
⅜ x ¾ in.	0.10

Cutting rates on most common applications such as gray iron and malleable iron are considerably higher than are possible on the stainless steels. Gate and riser cuts requiring but 2 or 3 sec, done at the rate of 15 to 20 sq. in. per minute are most common. Actual cutting time is negligible compared to that of handling the castings to and from the machine table, positioning for the various cuts and disposing of excess material. In short, exclusive of the square shear, no cutting process yet devised can compete with band friction sawing for thickness not exceeding ½ in.

Open New Naval Testing Laboratory

WORLD'S MOST COMPLETE LABORATORY of x-ray and other non-destructive testing apparatus was dedicated March 24-25, at White Oak, Md. Operated by the U. S. Naval Ordnance Laboratory, under the command of Rear Admiral Frank E. Beatty with Dr. Ralph D. Bennett as technical director, the new facility is under the direction of Dr. Leslie W. Ball.

Following dedication ceremonies the mobile betatron, resonant x-ray generator, microflash x-ray generator, electronic fluoroscope, x-ray moving picture camera, and the ultrasonic, magnetic, fluorescent and electrostatic inspection equipment were demonstrated. The remainder of the time, a day and a half, was devoted to a symposium on non-destructive testing.

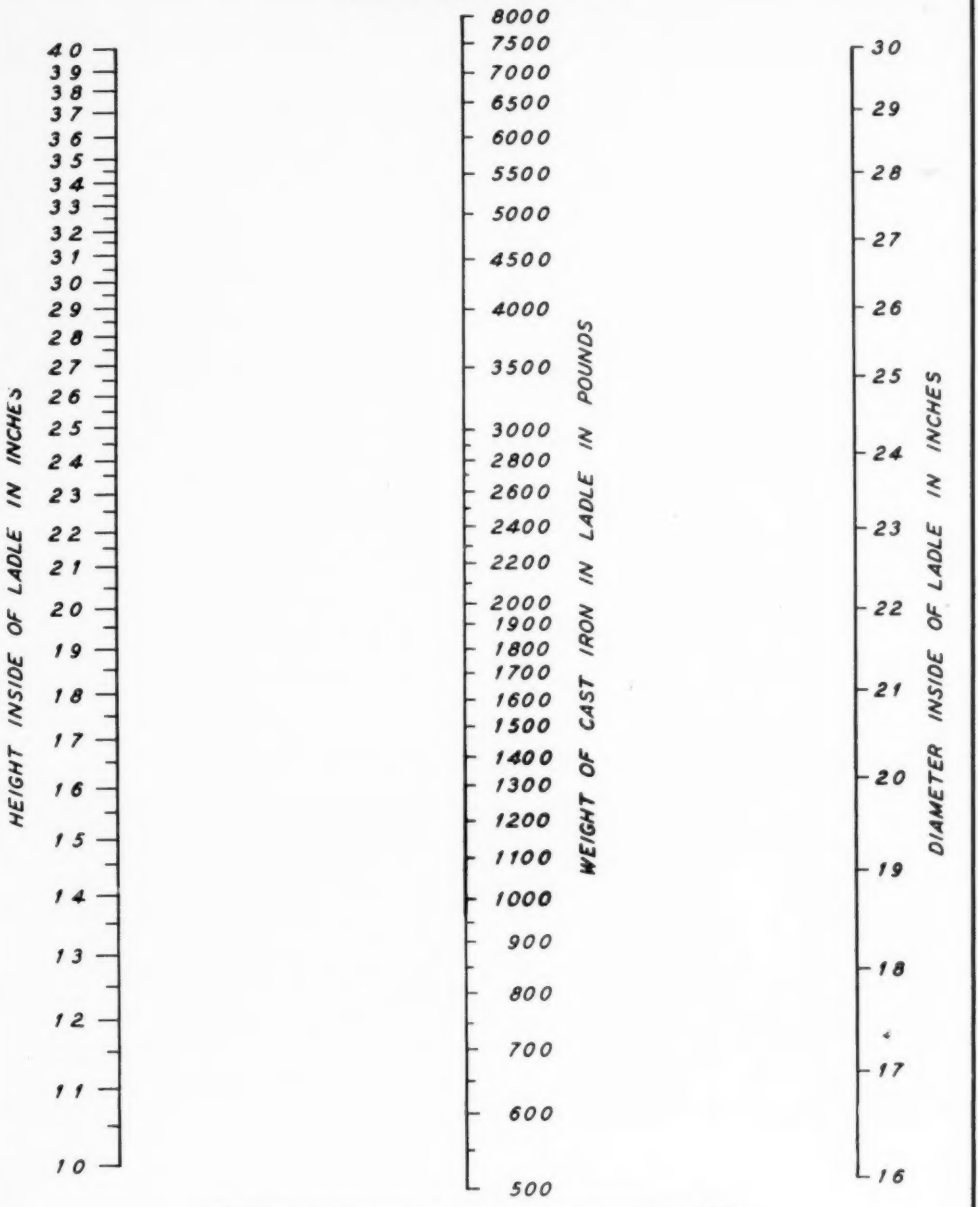
Purpose of the new laboratory is to explore and evaluate every known technique for non-destructive testing so that its proper place in the product-testing field can be determined. This information, to be passed on to Navy suppliers, is expected to be valuable in civilian as well as military production.

The laboratory will seek to promote and advance the use of non-destructive testing not primarily for inspecting finished material but for controlling manufacturing procedures. Manufacturers have been asked by the laboratory to bring in their special problems.

A.F.S. Heat Transfer Committee Discusses Research Project

The Heat Transfer Committee met in Cleveland, April 19. Present were, left to right, E. C. Troy, Palmyra, N. J.; A. E. Schuh, U. S. Pipe & Foundry Co., Burlington, N. J.; H. A. Schwartz, National Malleable & Steel Castings Co., Cleveland, committee chairman, and Victor Paschkis, in charge of the A.F.S. Heat Transfer Research Project at Columbia University, New York. Unable to attend were: J. B. Caine, Sawbrook Steel Castings Co., Lockland, Ohio, and Howard F. Taylor, M.I.T., Cambridge. Results of the project to date were briefed in the article "Expanding Research Program Advances Foundry Industry," p.66, April, 1949 AMERICAN FOUNDRYMAN.

NOMOGRAPH FOR DETERMINING CAPACITIES OF IRON FOUNDRY LADLES



EXAMPLE: Height inside of ladle = 24 in.; diameter inside of ladle = 18 in. Lay a straightedge from height (24 in.) to diameter (18 in.) and read iron capacity of ladle in pounds where straightedge intersects the weight scale, or weight = 1600 lb.

CONVERT LADLE DIMENSIONS TO IRON WEIGHT

H. L. Campbell
Precision Scientific Co.
Chicago

FINAL CONTROL of the composition of cast iron is usually accomplished by ladle additions of the alloying elements. The ferroalloys are supplied in a finely pulverized condition or in the form of shot. Many of the ferroalloys, because of their brittle structures, can be crushed to a fine state of division. Other materials which are soft and ductile, such as copper, can be handled most satisfactorily in the form of shot.

Because the alloys have melting temperatures near to the temperatures of the metal with which they are combined, it is important that the cast iron be superheated to a degree which will permit the complete solution of the alloys. As the metal in the ladle is cooling continuously, there is a limit to the amount of alloy which can be dissolved without leaving the metal too cold to pour satisfactorily. As a general rule, the ladle additions should not exceed 2.5 per cent of the weight of metal treated.

◀*Nomograph prepared for making rapid determinations of iron foundry ladle capacities in pounds*

The most satisfactory way to introduce the solid alloys is to add them gradually to the stream of metal while the ladle is being filled. A hopper with a gate at the bottom is often provided over the cupola spout for introducing the materials to the stream of molten metal. Otherwise, a metal can with a long spout and a convenient handle may be substituted.

Computing and weighing the materials for ladle additions is an important duty of the metallurgical supervisor. After establishing the desired ratios of the alloying elements, as well as the amounts of alloys to be added to definite weights of metal, these materials are prepared in packages. The most satisfactory basis for the calculation and weighing of the alloys is in pounds and decimals of a pound.

A beam scale graduated in tenths and hundredths on the beam and with counterpoises in pounds is most convenient for weighing the additions. A scale pan with a funnel at one end aids in handling the granular materials. Paper bags may be used to hold the weighed portions. If the quantity of metal to be treated is constant, fixed weights of the alloys are made up in advance. When the weights of treated metal vary, the additions must be made accordingly. In this case, the alloying materials are packaged in small units, to be added as needed.

A track scale at the front of the cupola offers a convenient means for determining the amount of metal to be treated at one time. If this equipment is not available, it may be necessary to calculate the capacity of each ladle.

After measuring the heights and diameters inside the transfer ladles, the amount of iron to be treated in each ladle can be found on the accompanying nomograph (see opposite page). A straightedge placed across the nomograph and connecting the given ladle height and diameter will indicate, at the intersection of the center vertical line, the weight in pounds of cast iron in the ladle. A metal scale graduated in inches and the nomograph conveniently placed at the point where the additions are made, will allow quick determinations of the amount of metal to be treated.

Computations for the alloy additions can be simplified by providing a table showing the weights of alloys required per unit of metal to be treated.

REGIONAL FOUNDRY CONFERENCES ANNOUNCED

Preliminary plans for three regional foundry conferences to be held the latter part of 1949 and early in 1950 have been announced. Previously reported were:

Michigan Regional Foundry Conference is to be held early in November at Michigan State College, East Lansing, and sponsored by the Central and Western Michigan, Saginaw Valley and the Detroit Chapters.

New York State Regional Foundry Conference, Nov. 25-26, Syracuse University, Syracuse, sponsored by the Western New York, Eastern New York, Rochester and Central New York Chapters.

Lastest regional foundry conferences planned are: the New England, scheduled for Oct. 7-8 at Massachusetts Institute of Technology, Cambridge; a conference set for Oct. 21-22 at Stevens Institute of Technology, Hoboken, N. J.; and the Ohio Regional Foundry Conference to be held in March, 1950.

Chairman of this year's New England Regional Foundry Conference is Arthur F. Dockry, H. & B. American Machine Co., Pawktucket, R. I. Sponsors are American Foundrymen's Society including the M.I.T. Student Chapter, New England Foundrymen's Association, Boston Chapter of the Non-Ferrous Founders' Society, Connecticut Foundrymen's Association and Connecticut Non-Ferrous Foundrymen's Association.

Joint sponsors of the regional foundry conference to be held at Stevens Institute are the Metropolitan, Philadelphia and Chesapeake Chapters. Harold Ullrich, Sacks-Barlow Foundry, Newark, N. J., is general chairman. Chairman of the Program Committee is John A. Bukowski, Worthington Pump & Machinery Corp., Harrison, N. J., with C. Louis Lane, Florence Pipe Foundry & Machine Co., Florence, N. J., and Blake M. Loring, U.S. Naval Research Laboratory, Washington, D.C., as members. George Baer, Atlas Stainless Steel Castings Div., Atlas Foundry, Irvington, N. J., is publicity chairman.

Tentative plans include an address of welcome by Dr. Harvey N. Davis, president of Stevens Institute, and group meetings on non-ferrous, steel, gray iron and malleable iron.

Host chapter for next year's Ohio Regional Foundry Conference is Cincinnati District Chapter. Other sponsoring American Foundrymen's Society chapters are Northeastern Ohio, Toledo, Central Ohio and Canton District.

CAST FIGURE PROCESS REDUCES MACHINING COSTS

George Krumlauf
Foundry Supt.
Altens Foundry & Machine Works
Lancaster, Ohio

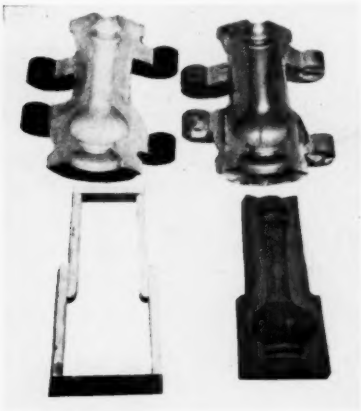
Iron mold made by the cast figure process for glass manufacturer shows detail sharpness before machining and finishing.

CAST FIGURE MOLDS are produced by foundry processes which vary somewhat from conventional casting methods. These method variations enable the foundry to produce a casting so true to detail that much of the machine work is eliminated. The use of molds manufactured by the cast figure process is becoming more common in the processing of glass, plastics, and light metals. Molds, rings, plungers, valves, forming equipment and similar parts manufactured by this method are found to have excellent life. They are more economical in final cost than parts produced by the conventional methods of machining from cast blanks in which the cavity is formed by the use of chills or sand cores.

The development of the cast figure process is not a result of recent research activity. The process was used originally on an experimental basis about the year 1905 for the manufacture of glass mold castings. These early products were used in the Beaver Valley district of Pennsylvania for the production of glass articles which were finally finished by conventional cutting and decoration methods. The first commercial scale production of molds of this type, of which the author is aware, may be credited to Damon and Harding at the Olive Stove Works in Rochester, Pa., about the year 1910. Walter Przybylek, of Pittsburgh, has long been associated with the process and is still active in the manufacture of plaster pattern equipment and models used in the process. Mr. Przybylek deserves much of the credit for the present status of the process.

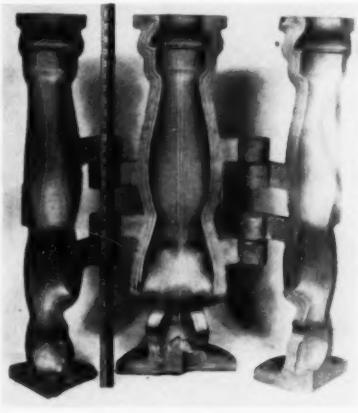
At the present time the process is being used for the commercial production of mold castings in Ohio, Pennsylvania, West Virginia, and Kentucky. Development of the process has progressed to the point where mold castings of extremely intricate design and close tolerances may be cast without difficulty. Plaster patterns are used for this work because of the ability to maintain fineness of detail and the elimination of costly carving necessary to produce similar pattern equipment from wood.

Plaster Pattern Equipment: The equipment used in the process is made by conventional methods. A model of the piece of ware is first made, usually of hard wood, and is submitted to the glass company for approval of the design. Following the approval of the ware design, a mold pattern is made and used as the basis for making the plaster pattern for producing the cores and mold castings. It is the author's understanding that the plaster used in the pattern-making process is a slow-



◀ *Plaster pattern, core frame, and ram-up core used in the cast figure process are shown with the casting produced.*

Three-part design ▶ *cast figure manikin mold made for glass production.*



setting type which develops high hardness when dried.

The cores used in the process are made by a composite method. The facing material is made from carefully screen-sized fused zirconium oxide mixed with a small quantity of a suitable oil binder. This facing material is evenly distributed over the cavity of the core box and is then backed up with an ordinary silica core sand mixture and finished in the usual manner.

Zirconium Oxide Facing and Mold Spray: The zirconium oxide used in the core-facing mixture is of the round-grain type of the following approximate screen analysis: 52 per cent through 100 on 140 mesh; 25 per cent through 140 on 200 mesh; balance through 200 mesh.

While ordinary core oils may be used successfully as binders for the facing material, the best results have been obtained with raw linseed oil at a ratio of about 125 parts sand to 1 part oil. It is recognized that this is a very lean mix, but the backing core sand is depended upon for strength after the initial baking of the core. The final spraying operation gives the

Cross section of composite core made with zirconium oxide facing sand backed up with silica core sand.

necessary face hardness for the cores. A small laboratory mixer is used for preparing the facing sand, mixing about 20 lb at one time. Ordinary practice is used in baking the cores.

The milled zirconium oxide wash is composed of 325-mesh material in an emulsified oil base carrier. This is mixed to a rather thin consistency suitable for spray gun application, and a light coating is applied to the face of the core. The spraying should be carefully done to avoid excessive coating of the core, as this will result in loss of detail. Another factor is the tendency of the spray coating to run if applied too heavily.

Extreme care must be used in drawing the core box to avoid tearing or otherwise damaging the surface of the green core because the facing material does not lend itself readily to patching or repairing of damaged core surfaces. The green cores are dried at temperatures of 400 F to 425 F until the bond is completely developed. The cores are heated slowly during the initial stages of the drying operation to prevent cracks.

Core Inspection and Finishing

The dried cores are allowed to cool to near room temperature, after which they are inspected for defects. They are finished by being fitted to the pattern from which they were made and then sprayed lightly with a coating of wash composed of finely milled zirconium oxide in an emulsified oil base carrier. This spraying operation serves the dual purpose of filling any hair-

Cast figure mold made for rubber mask production.

line cracks on the surface of the core and providing an exceptionally smooth finish which is highly resistant to heat. The cores are dried after spraying.

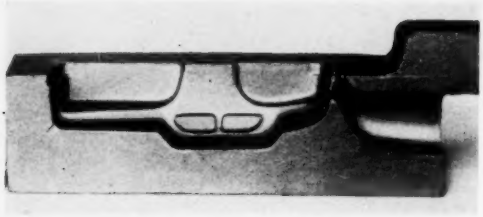
Molding methods do not vary to any great extent from those used in normal foundry practice. The jobs are generally worked by bench molding methods with loose pattern equipment. On rare occasions it is possible to use machine methods when the quantities needed are sufficiently great and the outer contour of the casting is simple enough to lend itself to these methods. On production work of this type the cores are also produced by machine, but are not blown.

Core setting must be carefully done to prevent loose dirt in the mold and obtain uniform positioning in order to maintain consistent tolerances in the finished castings. When possible, the core may be used as a cover core, but any loose dirt will trap against the cast figured surface and result in scrap.

Gating Practice Varies

Gating: The molds are gated by the use of ram-up pattern sections or cut by hand methods, whichever is most adaptable to the job. It has been found that only slightly larger gates are required to overcome the chilling tendency of the zirconium oxide facing material. Strainer cores or inverted step gates are frequently used to prevent the inclusion of slag or other foreign material. Of course, the pattern equipment and general complexity of each job must be considered in gating the mold, and no one practice is followed for all types of cast figure work.

Alloy Compositions: The alloys used in the production of mold castings vary somewhat on the basis of the end use of the casting. Since various types of equipment and operation are involved in the production of glass, plastic, and light metal articles of commerce, it



One of two cast figure pieces forming a permanent mold for production of light metal and plastic toys.

is not likely that any one alloy would serve all purposes to the best advantage. For example, castings for use as glass molds, valves, and plungers, must have good machining characteristics, resistance to heat and pressure, and close grained structures which will take a high polish. For other applications, particularly where high pressures are involved, it is also necessary to consider the factors of pressure, temperature, and corrosive effects of the materials used.

The alloy compositions generally used for glass molds are Cr-Mo alloy iron, containing approximately 0.50 to 0.70 per cent chromium and 0.30 to 0.40 per cent molybdenum, and Ni-Mo alloy iron, containing approximately 0.50 to 0.70 per cent nickel and 0.20 to 0.30 per cent moylbdenum.

In addition, alloy irons are made to suit customer specifications. Generally speaking, the greater percentage of the tonnage in figure molds is made from the Ni-Mo alloy. This material has been found to give good service life in the glass industry, as well as having apparently better machining characteristics than the Cr-Mo type iron.

Metallics in Mold Facings: It is interesting to note, however, that a slight chilling tendency is promoted by the cast figure cores, which results in a more dense and uniform structure on the surface of the casting. This effect may be accelerated by the judicious use of metallics in the core-facing mixture, and by control of melting and ladle practice. The use of metallics in sand facing mixtures has been investigated from an experimental point of view, and the technique applied to the production of glass molds in a few instances where greater depth of dense iron was a necessity.

Careful Spraying Necessary

Clean crushed shot residue was obtained from the plant cleaning equipment and mixed with the facing sand in proportions of about 10 per cent metallics by weight. This has proved to be advantageous in these applications; however it is necessary to do a careful job of spraying the cores in the finishing operation to prevent contact between the molten metal and the slightly oxidized metallic particles in the core facing. Unless the spraying operation has completely coated the core face, the casting will show pin holes.

The comparative chilling tendencies of the core mixes are in the order of 1 to 2.5; that is, where the zirconium oxide face core would give a ¼-inch. depth of dense metal, ½ to ⅝-in. depths would be obtained with a core containing metallics. This, of course, assumes no significant variables in metal composition.

The limitations of the process with respect to the size of castings produced are rather wide and not definitely established. Mold castings of this type have been produced in weights from one to 600 lb. Close tolerances in cavity size are maintained; for example, a set of 26 castings for 8-in. plate molds for glass production was made recently and held to tolerances of less than 0.005-in. in the cavity size of the entire set of molds. Similar castings for use as permanent molds for metal casting have been regularly held to tolerances of less than 0.010-in.

Advantages of the process from the standpoint of the consumer of mold castings are evident. It is not uncommon to eliminate as much as 75 per cent of the machining time required to produce a mold by the conventional method of manufacture. Parts having a wide variety of intricate contours, or depressed and raised figures, may be cast with comparative ease and held to close tolerances. In many cases polishing is the only operation required to finish a glass mold.

This hard rubber handle is shown with part of the cast figure mold equipment used to produce it.

A variety of metal compositions are available and may be tailored to fit the requirements of the end use of the castings. The cost of plaster patterns and core equipment is less than that of duplicate equipment made from wood or metal. The service life of molds and other items produced by the cast figure process has been found to compare quite favorably with similar items produced by conventional methods. The quality and lustre of finished products made from cast figure molds equals that obtained by other methods.

The over-all advantages of the process are well worth the consideration of engineers and purchasers of castings which require close tolerances, intricate design, or excessive machining to produce a finished item. While the initial cost of mold castings and other items made by the process is somewhat greater than that of items produced by generally used methods, the cost of the finished product is less when due consideration is given to the factors mentioned.

Chapter Now Named Eastern Canada

Eastern Canada Chapter is the new name of the former Eastern Canada & Newfoundland Chapter following recent action of the chapter's board of directors. Decision to change the name followed incorporation of Newfoundland into the Dominion of Canada, according to Chapter Chairman O. L. Voisard, Robert Mitchell Co. Ltd., St. Laurent, Que.

Foundry Data { COLLECTING ORGANIZING ANALYZING

Dr. W. K. Bock
Research Engineer
National Malleable & Steel Castings Co.
Cleveland

QUESTIONS FREQUENTLY ARISE in the foundry, the answers to which are based on the problem of the reproducibility of mechanical properties. Quality control programs constitute a continuing check on the reproducibility of these properties. Suppose a foundry is faced with a slight tightening of specifications. What percentage of rejects should occur under the amended specification?

Again, if an alloy is made by two different melting methods, are essentially different properties produced in the alloy? If a new idea in deoxidation practice is tried for a few weeks, can it be said to have improved the product? To answer such questions some knowledge of the reproducibility of mechanical properties is required.

It is pointless to give values for the over-all reproducibility of mechanical properties since they will vary from one foundry to another and within a foundry from one alloy to another. Data comparing one pattern with another, one melting method with a second, one deoxidation practice with some other may have some meaning since all other variables are held constant. However, when the whole process is considered it becomes necessary for each foundry to make its own determination.

Understanding Statistics

In general, the method of determining the reproducibility of mechanical properties may be divided into three steps: (1) collection of data; (2) organization of data; and (3) analysis of data.

The first two steps usually present no difficulty. Testing of experimental heats, or review of inspection data will take care of the first step. The second step involves such common manipulations as tabulating, grouping, averaging or graphing. The last step is not so simple. Here we must use data on past heats to predict the data which will be obtained on future heats.

Another operation included in the third step is drawing inferences about possible differences shown by the data. Unless we want to carry out the third step by means of the "I guess—" prediction and the "it is-it ain't" argument for drawing inferences we must fall back on statistical methods of analyzing data.

NOTE: This paper was presented at Wisconsin Regional Foundry Conference sponsored by the A.F.S. Wisconsin Chapter, at Milwaukee, Feb. 10-11, 1949.

Here, then, is the source of the difficulty about the analysis of data.

Statistics is a branch of mathematics based on the probability theory. Like any specialized form of mathematics, it uses equations which appear strange to those with the ordinary amount of mathematics behind them, and its vocabulary is quite strange. Luckily, there are people who can handle the necessary manipulations, but if their work is to mean anything to the rest of us we should understand the basic concepts of the subject.

It is proposed here to discuss these fundamental ideas and, at the same time, to limit severely our use of mathematics. If the reader desires a more rigorous treatment he will find it in the references given.

Assume we have been making a certain alloy by some definite practice. With each heat we try to obtain a given set of mechanical properties; for example, we try to make each heat so that it will have a given tensile strength. We know that there are inescapable variations in our process and, try as we will, the tensile strength varies from heat to heat. When we look at our inspection data carefully we find that no relation exists between any heat and any other—the variations are random. We do notice that there have been heats in which the tensile strength was far too high or too low.

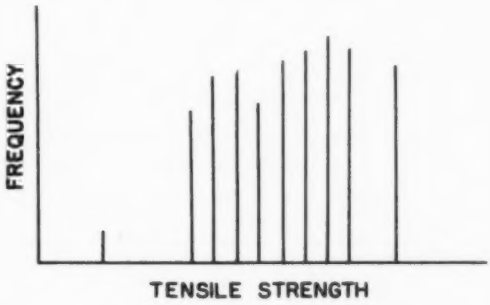


Fig. 1—Bar diagram showing the number of furnace heats falling within selected tensile strength ranges.

If the records are complete an investigation of these heats will indicate that a change in process had occurred—something went wrong in the foundry. These data will be disregarded because obviously they belong to a different universe. (There are mathematical methods[1] of determining whether or not data should be

discarded.) For our purpose the universe is made up of the tensile strengths of all past *and future* heats made by our set practice.

The data from inspection reports are probably voluminous. In order to reduce the bulk to convenient size we embark on the second step of the process by grouping them. We divide the entire range of tensile strengths into a number of smaller, equal ranges or cells and note the number of heats whose tensile strength falls into each cell.

Here we may note some more extreme values for which no cause could be found. We will have to keep these data, however, because there may have been no change in practice to produce these extreme values. Perhaps something in our practice does actually produce an occasional extreme value. If so, we want to recognize the fact.

We can go one step further and use the grouped data to construct a bar diagram. In Fig. 1 we have plotted tensile strength horizontally, and at the tensile strength corresponding to the midpoint of each cell erected a perpendicular whose length is proportional

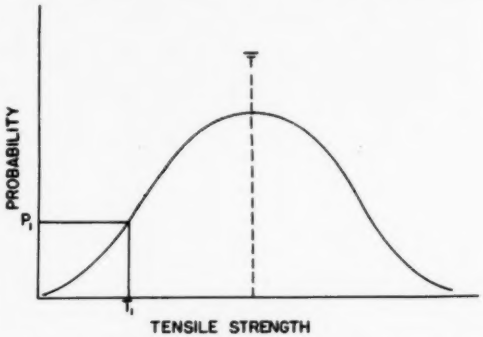


Fig. 2—Probability curve developed from bar diagram in Fig. 1 shows that the greatest number of heats will fall close to the mean tensile strength with only a very small percentage having extremely low or extremely high tensile strength values.

to number of heats represented in that cell. At the left there is a line showing a few heats which are quite distant from the center of the mass of lines. If we make more heats will there ever be any as far to the high side? Just how weak a heat is our process likely to produce?

If we are to answer such questions we need a curve which describes the strengths which can be made. We will want to use data on heats of the past to predict what will happen in future heats. This is a complete picture of the universe with which we are working.

A curve which fitted smoothly to the ends of the lines of the bar diagram would show frequencies where data are lacking at present (it would fill in the gaps), and by its course would extend to lower and higher strengths and so indicate possible frequencies at these levels. This, then, would satisfy our need for a picture of our universe.

There are methods[2] for indicating the shape of the curve and for determining the equation of it,

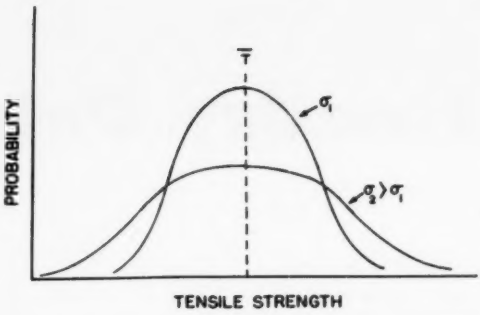


Fig. 3—The flatter curve shows a higher proportion of heats with tensile strengths farther from the mean and indicates less satisfactory control.

but we have elected to avoid equations and so must continue with our illustration. We can make certain assumptions about the distribution of tensile strengths:

1. Since a large number of determinations of strength were used, the addition of more data will not much change the value of the average. The basis for this will be shown later.

2. Given deviations from the average above the mean and below it are equally probable. This indicates that the curve will be symmetrical about the mean or average.

3. All values of tensile strength are possible. It follows that the curve will be smooth, continuous, and that it can be extended beyond the range of data available.

4. Small deviations from the mean are more likely than large ones. If this condition does not hold there will be trouble in the foundry.

The foregoing discussion points to the use of a gaussian distribution, the so-called normal curve. As a matter of practice this curve would be used if it fits well enough for practical purposes. There are tables for the integral and the derivatives of this function which save much of the labor of calculations when working with the distribution function. Other distribution laws are not so supplied with tables and charts.

Fitting a Gaussian function to our data might produce a curve like that in Fig. 2. It would not make any difference in the shape of the curve whether we plot frequency or percentage of observations on the vertical axis. We can interpret the latter quantity as probability and so make our graph useful for future heats.

The equation for this curve may be written

$$P = \frac{1}{\sigma\sqrt{2\pi}} \exp\left[-\frac{(T-\overline{T})^2}{2\sigma^2}\right]$$

in which P is the probability, T is the tensile strength, $\overline{T}$ is the average tensile strength, σ is the standard deviation, a measure of the scatter in the universe. With a given value of the average the shape of the curve is determined by σ. The effect of changing σ is indicated in Fig. 3 where the broader curve has a higher value of the standard deviation than

the other. The effect of changing $\overline{T}$ is merely to shift the curve along the horizontal axis.

It follows that by determining $\overline{T}$ from our data we locate the center of the curve. The exact shape then depends on the value of σ, and this comes from the scatter of results; that is, from the extent and spacing of lines in Fig. 1.

Reasons were given for selecting the Gaussian distribution. We do not claim that tensile strength is distributed according to this law, but the curve will fit well enough for all but the most exacting work. It should be mentioned that fitting any curve to observed data involves some judgment and some compromise. Probably no standard distribution will fit exactly to a set of data. We must do the best we can —a matter of judgment—and must bear in mind that we may have to perform calculations based on the chosen curve, and so a compromise between fit and convenience is required.

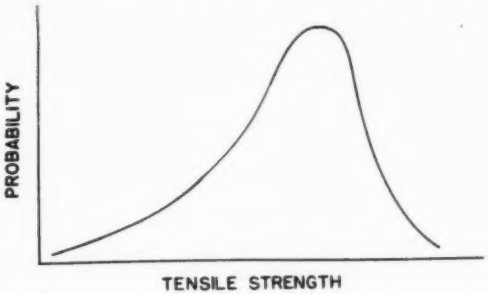
Obviously, incorrect curves are worthless. Suppose the alloy is extremely sensitive to sonim distribution, to slight imperfections and misalignment of the test bar. Other variables in the process would tend to make the curve symmetrical about the mean, and these others would produce lower tensile strengths but never higher strengths. A curve like that shown in Fig. 4 would be required. Such curves are met with occasionally in this problem of reproducibility of mechanical properties. The mathematics of such a curve is complex.

Published Tables Simplify Work

Returning to Fig. 2, it may be seen that the curve gives the probability P_1 of obtaining a heat with a tensile strength T_1. If all the probabilities corresponding to all the tensile strengths below T_1 were added we would have the probability of obtaining heats with strength values below the level T_1. This is simply integration between limits which calculus teaches is the area under the curve to the left of T_1. By setting proper limits of integration we can obtain the probability of making heats with strengths between any desired limits. It is here that the published tables of the probability integral are of service.

It should be noted that our results are always expressed in terms of probability. We cannot say what the tensile strength of the heat we are going to make tomorrow will be, but we can say what percentage of rejections to expect next month. We can get an over-all picture but no specific details. Perhaps this is disappointing, but it should be remembered that experience has shown that the information given by statistics is of sufficient value to warrant the work.

Fig. 4—Unsymmetrical curve showing effect of variables which can cause a greater proportion of low tensile strength values without a corresponding effect on number of heats of higher tensile strengths.



Returning to the problem of the reproducibility of mechanical properties, assume that there are available data on heats made by two different practices—perhaps basic and acid furnaces were used. Did one method of melting produce stronger steel than the other? To answer this we extend the method previously outlined to two universes. First we divide the data according to the melting practice and obtain the probability curve for each universe. The resulting graph would look something like Fig. 5.

Experience tells us that even if the two methods produce the same strength metal, two averages taken as these were should not agree exactly, but how well should they agree before we say there is no difference?

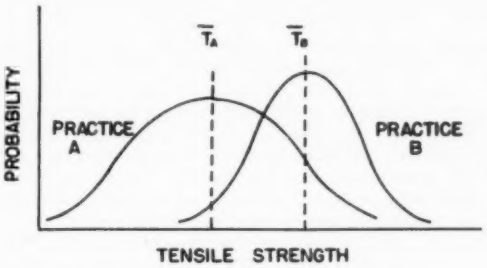


Fig. 5—Effect of different melting practices on mean tensile strength and distribution of strength values.

We notice also that the spread of results is different in the two universes. How should this affect our decision on the question? Suppose we repeat the whole process and derive new graphs. We might note that the scatter in each universe is about the same, but the means T_a and T_b of practice A and practice B, respectively, are slightly different.

If we have sufficient time and money we can repeat the experiment a large number of times and find that the values of T_a and T_b behave like tensile strength itself. The mass of values of these averages have a distribution function of their own. We could obtain a curve like Fig. 2 for probability as a function of T_a instead of as a function of tensile strength. Another curve would be obtained with T_b as a variable.

This might prompt us to examine the difference $T_a - T_b$. We would find that this difference could be used as a variable, and a probability curve for this case could be drawn. Probably we would observe that the mean and standard deviation of this curve was related to the means and standard deviations of the tensile strength deviations. Such is the case.

After years of work we have established a curve so that if we observe a difference between two practices we will know the probability that such a difference

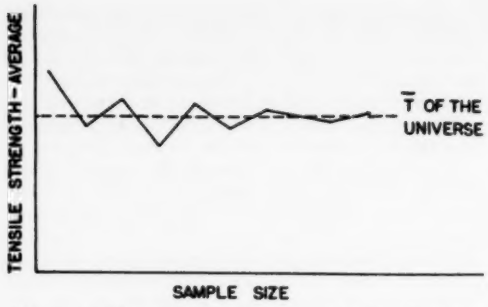


Fig. 6—As the number of tests made (sample size) increases the average of the results obtained is closer to the average tensile strength for the heat.

is due to chance causes and, of course, the probability that the difference is real. For illustrative purposes our example serves well enough, but the prohibitive amount of work involved makes it impossible to do. Based on reasoning something like the foregoing, there are methods[3] for determining the probability that the difference obtained by two practices is due to chance, and the method requires only a small number of samples.

Again we do not obtain a "yes-or-no" answer, but only a quotation of the odds. To place a bet we must decide how much risk we are willing to take. This is a matter of confidence limits. Here we have general practice to guide us. When we ask, "Do the two practices produce the same tensile strength in the metal?" we imply that the melting methods are equal in this respect. So we set up the null hypothesis that they are not equal, that the average tensile strengths are different, and seek information which will enable us to reject the hypothesis.

How Many Test Bars Should We Break?

If the probability of rejecting our hypothesis if it is true is 0.05 or less we reject the hypothesis. Thus if we assume that the difference in means is not due to chance and find that there are only 4 chances in 100 of obtaining the difference we find, we reject the hypothesis that the difference is real and say that the two means do not differ significantly.

This sounds quite definite, but if we remember there is no reason except experience in many places for accepting the 0.05 limit mentioned our structure is not so rigid. If some other limit is accepted it can change our decision entirely. At least, we have a definite numerical basis for our decision and can present it along with the decision so that it will be clear how we arrived at our decision.

Another aspect of the problem of reproducibility of mechanical properties deserves mention. If we want to know within certain limits the tensile strength of a material, how many test bars should we break? We omit questions of sampling and assume it was properly done. If we break one bar we feel we have a rough idea of the tensile strength. Using mathematical methods from the literature[4] it is possible to calculate the range on either side of a single determination in which the true average will lie. These ranges are surprisingly large.

If we want to be more sure of the value we run multiple samples, duplicates, triplicates, etc. Occasionally we may break ten bars. If we average two, then three, then four determinations and continue until our sample is quite large, we can plot the average of each sample against the number of determinations in the sample. The resulting graph will look like Fig. 6, which shows a common phenomenon. The value of the average of a sample varies widely for small samples and almost not at all for large samples. Roughly, this means that if we break duplicate or triplicate bars there is still a good bit of uncertainty, but if we break a large number, perhaps ten, there is little to be gained by using larger samples, say, fifteen.

The effect of sample size is merely observation, not statistics. The methods of statistics[4] permit the calculation of the required size of sample. Suppose we want to know how many bars to break so that nine times out of ten the average of the universe will fall within a given range on either side of the average of the sample. The required sample sizes may be computed for various

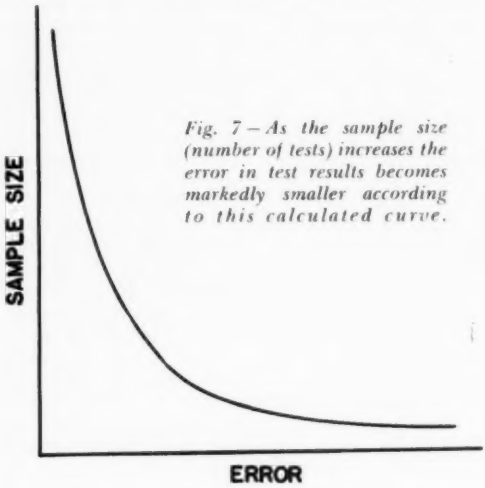


Fig. 7—As the sample size (number of tests) increases the error in test results becomes markedly smaller according to this calculated curve.

sizes of the range or errors. As might be expected the shape of the curve is that shown in Fig. 7. Small samples may have large errors and large samples much more accuracy.

All of these problems concerned with the reproducibility of mechanical properties involve data from the distribution curve. Prediction of tensile strength, calculation of the probability of the difference between methods being real, computation of the size of sample for given accuracy all require knowledge of the mean and standard deviation.

Bibliography

1. W. A. Shewhart, *Economic Control of Quality of Manufactured Product*, D. Van Nostrand Co., New York.

2. T. C. Fry, *Probability and its Engineering Uses*, D. Van Nostrand Co., New York.

3. S. S. Wilks, *Mathematical Statistics*, Princeton University Press, Princeton, N. J.

4. H. Cramer, *Mathematical Methods of Statistics*, Princeton University Press, Princeton, N. J.

ELECT EDUCATIONAL FOUNDATION OFFICERS

Officers and trustees who will lead the Foundry Educational Foundation during its third year, 1949-50, were named at the annual meeting held during the 53rd Annual A.F.S. Convention in St. Louis, May 2-5. Now actively working with seven major engineering schools, the Foundation is promoting interest in foundry careers among engineering students by adding in curricula make-up, by providing financial support through equipment and scholarships and by placing students and graduates in summer and permanent jobs. Participating schools are Cornell University, University of Wisconsin, Massachusetts Institute of Technology, Northwestern University, Case Institute of Technology, University of Cincinnati and the University of Alabama.

Succeeding Anthony Haswell, Dayton Malleable Iron Co., Dayton, Ohio, as chairman of the board is Peter E. Rentschler, Hamilton Foundry & Machine Co., Hamilton, Ohio, who followed Mr. Haswell as president of FEF a year ago. New president is Stowell C. Wasson, National Malleable & Steel Castings Co., Chicago. B. D. Claffey, Acme Aluminum Alloys, Dayton, Ohio, was elected vice-president. Continuing in office are Charles A. Barnett, Foundry Equipment Co., Cleveland, secretary-treasurer, and George K. Dreher, executive director.

P. E. Rentschler

S. C. Wasson

The following trustees represent the founding members of the Foundation: Malleable Founders' Society—Mr. Haswell and Richard W. Crannell, Lehigh Foundries, Inc., Easton, Pa.; Gray Iron Founders' Society—John M. Price, Ferro Machine & Foundry Co., Cleveland, and Mr. Rentschler; American Foundrymen's Society—Mr. Wasson and Fred G. Sefing, International Nickel Co., New York; Foundry Equipment Manufacturers Association—Mr. Barnett and Claude B. Schneible, Claude B. Schneible Co., Detroit; Non-Ferrous Founders' Society—George B. Hazen, Brass Foundry Co., Peoria, Ill., and W. B. Wilkins, American Manganese Bronze Co., Philadelphia; Steel Founders' Society of America—T. F. Dorsey, Fort Pitt Steel Casting Co., McKeesport, Pa., and Homer Tielke, Crucible Steel Casting Co., Inc., Cleveland.

Trustees-at-large for FEF are: Jas. H. Smith, Central Foundry Div., General Motors Corp., Saginaw, Mich.; Mr. Claffey; C. R. Culling, Carondelet Foundry Co., St. Louis; Brinton Welser, Chain Belt Co., Milwaukee; James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala.; George J. Behrendt, Eastern Malleable Iron Co., Naugatuck, Conn.; and A. W. Gregg, Whiting Corp., Harvey, Ill.

Seventh FEF school, the University of Alabama, is setting up a course of study at the request of Southeastern foundries affiliated with the Foundation. Work will be centered in the metallurgical engineering department under Prof. E. C. Wright, although engineering students will be able to elect the subjects offered.

Space for the foundry laboratory is being provided by the university. Equipment and funds for the program are being supplied through the efforts of the Alabama Advisory Committee of the Foundry Educational Foundation. James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, is committee chairman. Equipment is being procured under the guidance of S. D. Moxley, American Cast Iron Pipe Co., and funds are being raised through the efforts of L. N. Shannon, Stockham Valves & Fittings, Inc. W. E. Jones, chief engineer of Stockham is providing engineering assistance to the Committee.

Plan Safety And Hygiene Program

FIRST MEETING of the reorganized Safety & Hygiene Committee was held May 5 during the A.F.S. Convention in St. Louis under the chairmanship of Lee C. Wilson of Reading, Pa. Inactive for several years, the committe set up a program and will study present codes, giving consideration to their revision.

In addition to Chairman Wilson, the members of the committee are: T. J. Glaza, Crane Co., Chicago; A. G. Granath, National Engineering Co., Chicago; John M. Kane, American Air Filter Co., Louisville, Ky.; Robert H. Mooney, Saginaw Malleable Iron Plant, General Motors Corp., Saginaw, Mich.; W. O. Vedder, Pangborn Corp., Hagerstown, Md.; and Herbert J. Weber, American Brake Shoe Co., Chicago.

Print International Foundry Study

RECENTLY RELEASED is the book *10 Sections of the Modern Foundry Industry*, published by the Society for Development and Research of Norwegian Industry and written by John Sissener, Oslo (Norway) engineer.

Describing foundry operations in detail and profusely illustrated, the book is based on the author's experiences in the United States in 1946, and in England, Sweden, Finland, Norway and Denmark during 1946 and 1947. During a four months trip to the United States in 1946, Mr. Sissener visited the 50th A.F.S. Foundry Congress and 34 foundries.

The ten chapters of the book are entitled: (1) Planning of Foundries; (2) Roller Conveyors and Mechanized Foundries; (3) Sand Preparing Systems; (4) Sandslingers; (5) Wet Cleaning of Castings; (6) Mechanical Charging of Cupolas; (7) The Cement-Sand Process; (8) Centrifugal Castings; (9) Electric Melting of Cast Iron; and (10) Sand Reclamation.

PROPERTIES OF REFRACTORY MATERIALS....

Material	Formula for pure material	Melting point	True specific gravity	Hardness (Moh's scale)	Mean specific heat (*A*)	Thermal expansion (*B*)	Thermal conductivity (*C*)			Electrical resistivity in ohms/cm³ (*D*)		
							1000°F	1600°F	2400°F	1500°F	2000°F	2500°F
Alumina (Corundum)	Al_2O_3	2015°C 3660°F	4.0 (*1*)	9	0.270 (30-1300°C)	8.1 (20-1250°C)	22.0* (*2*)	18.0* (*2*)	16.2* (*2*)	140,000* (*3*)	24,000* (*3*)	170* (*3*)
Beryllia (Beryllium oxide)	BeO	2510°C† 4550°F (*4*)	3.03	9	0.29	9.3 (25-1400°C)			104.0 (2190°F)	$4x10^{14}$	$3.5x10^{12}$	$2x10^{11}$
Carbon, blast furnace grade	C (*5*)	(*6*)	2.10	4 to 6	0.25*	4.0*	27*	24*	19*	0.00305*	0.00305*	
Chromite	$FeO.Cr_2O_3$ (*7*)	2180°C 3956°F	4.5	5.5	0.22*	8.0*	12.6*	12.7*	13.2*	650*	185*	40*
Diaspore (*8*) (Diasporite)	$Al_2O_3.H_2O$	2015°C 3660°F	3.4	6.5 to 7	0.25†	6.5*	11.6* (*9*)	10.9* (*9*)	10.0* (*9*)	10,500*	1,650*	350*
Dolomite	When calcined CaO.MgO	Above 2570°C 4660°F	2.83–2.99	4.0	0.222 (20-100°C)	14.0		15.0* (1500°F)				
Fireclay refractories*	(*10*)	(*11*)	2.6-2.7	(*12*)	0.259 Range 0.252-0.266	$1.0x10^{-6}$ (25-200°C) $5.1x10^{-6}$ (200-1000°C) (*13*)	7.7 (*14*)	9.1 (*14*)	10.9 (*14*)	23,500†	4,200†	1,000†
Forsterite	$2MgO.SiO_2$	1890°C† 3434°F	3.19	6 to 7	0.22 (20-100°C)	10.5*	11.3*	10.6*	9.7*			
Graphite	C	(*15*)	2.25	1 to 2	0.34*	1.5*	700*	600*	500*	0.00076*	0.00079*	0.00084*
Magnesia (*16*) (Periclase)	MgO	2800°C 5072°F (*17*)	3.6	6.0	0.287 (30-1300°C)	14.3 (20-1400°C)	27.6*	22.9*	20.0*	$4x10^{4*}$	$3.6x10^{3*}$	10,500*
Magnesia spinel	$MgO.Al_2O_3$	2135°C† 3875°F	3.6	8	0.257	9.0 (20-1250°C)	12.2*	13.3*	14.5*	Very high	High	
Mullite	$3Al_2O_3.2SiO_2$	1830°C 3326°F (*18*)	3.16	7.5†	0.238	5.3 (*19*)	16.6 (*20*)	14.2 (*20*)	13.2 (2000°F) (*20*)	80,000* (*21*)	11,200* (*21*)	Under 1,000* (*21*)
Quartzite (*22*) (Quartz)	SiO_2	1715°C 3119°F (*23*)	2.65	7	0.253	40* (*24*) 6* (*25*)	9.6* (*26*)	11.6* (*26*)	14.4* (*26*)	240,000* (*26*)	28,000* (*26*)	9,200* (*26*)
Silica–Vitreous	SiO_2	1710°C* 3110°F (*27*)	2.2	7	0.134 (20-1200°C)	0.54*			13.3* (2370°F)	$2x10^{8*}$ (1000°F)	$2.2x10^{7*}$ (1400°F)	
Silicon carbide	SiC	2200°C† 3990°F (*28*)	3.17 to 3.21	9.5	0.19 (*29*)	5.2* (*30*)	45.5* (*30*)	46.6* (*30*)	48.5* (*30*)	11,000* (*30*)	6,500* (*30*)	1,500* (*30*)
Sillimanite minerals (*31*)	$Al_2O_3.SiO_2$	1816°C 3300°F	3.24	6 to 7.5	0.17	5.4*	10.6*	11.0*		140,000*	21,000*	4,500*
Thoria	ThO_2	3050°C† 5522°F	9.69	6.5†	0.06	9.4 (20-1400°C)				$6.1x10^{12}$	$5x10^{11}$	$6.5x10^{9}$
Zircon (Zirconium silicate)	$ZrO_2.SiO_2$	2500°C 4532°F (*17*)	4.7	7.5	0.132 (21-51°C)	5.1 (20-1250°C)	19.9*	16.3*	14.2* (2000°F)	High up to dissociation temperature		
Zirconia (Zirconium oxide)	ZrO_2	2700°C 4892°F	5.5 to 6.1	6.5	0.168	11.0* (20-1250°C) (*32*)	5.0* (*32*)	5.0* (*32*)	5.0* (*32*)	High below 1470°F		

NOTE: Properties refer to pure materials except those marked with asterisk (*) which were obtained from commercial products. Data for a commercial refractory may differ from those of the pure material because of impurities, bonding materials, and process of manufacture. The specific heat, thermal expansion and conductivity data, however, may be used for engineering purposes.

† Approximate.

A. For the range 20 to 1000 C (68 to 1832 F) unless noted.

B. Mean reversible thermal expansion per C times 10^{-6}, for the range 20 to 1000 C unless noted.

C. Thermal conductivity in B.t.u./sq. ft./hr./F/inch thickness, from the more reliable data or an average.

D. Available data show wide variation for a given material resulting from lack of a standardized method of testing along with the influence of chemical composition and physical properties.

1. Alpha corundum.
2. 99% alumina product.
3. Brick with alumina content of 85%.
4. Volatile above 1650 C in presence of water vapor and is toxic.
5. Blast furnace grade 90% carbon
6. Oxidizes but in reducing atmosphere gradually converts to graphite above 2200 C.
7. General chemical formula for chromite is $RO.R_2O_3$. The RO oxide is usually FeO and may be replaced in part by MgO, while the R_2O_3 is mostly Cr_2O_3 but may be replaced in part by Al_2O_3 and Fe_2O_3.
8. Commercial diaspore is composed of diasporite grains bonded with clay.
9. Diaspore brick 75% alumina, porosity 30%.
10. Silicates of aluminum having a wide range in composition depending upon type of product; silica range 50 to 75%, alumina 20 to 45%. The ratio of silica to alumina and fluxing constituents present are principal features.

S. M. Phelps
Director of Research and Tests
Refractories Fellowship
Mellon Institute
Pittsburgh

A LIST OF THE PROPERTIES of refractories, not including those made of fire clay, was published in the American Refractories Institute *Technical Bulletin* No. 57 (1935). Since that time additional and more accurate determinations have been made by various workers, and the more up-to-date have been incorporated in the accompanying table which, with the following text, has been reprinted from the American Refractories Institute *Technical Bulletin*, Nov., 1948.

Furthermore, new types of refractories have appeared. Carbon, in block form, for use in lining the lower portion of blast furnaces is of interest because it has been installed in nearly 40 furnaces. Beryllia and thoria were studied during the war period for special uses, and these oxides are now available in small pieces of refractory ware. Their use is limited because of cost, particularly thoria, and the toxicity of beryllia should be kept in mind.

Fireclay refractories constitute the largest volume used but their properties should really be the subject of a separate bulletin. Even though there is more information available for the properties of that type of refractory than for all others combined, this information is, for practical reasons, of a somewhat different nature than that given in the table. In general, the evaluation of fireclay and other widely used refractories is based on a group of tests which are designed to provide the user with a more or less practical answer for his problems. Fireclay refractories have, however, been included in the table, and the values and comments pertain to the broad range covered by the various types of that product.

The electrical resistivity of refractories is of interest to some furnace designers, and in recent years additional data on this property have been accumulated. The values are only approximate because of the variation in resistivity of various finished products made of the same base material and, of more importance, the lack of a standard measurement method.

Mention should be made of progress achieved in recent years on standardizing a method for obtaining the thermal conductivity of refractories. As a result of much careful work, Committee C-8 of A.S.T.M. has found it in order to adopt a standard method of conducting this difficult test. As yet, data for all the various kinds of refractory materials have not been obtained by the use of that method; consequently, some of the thermal conductivity may be subject to change at a later time.

The table may appear to be incomplete because it does not contain comments for the resistance of the materials to slag action, spalling deformation under hot load, and other properties. These are not included because it is often misleading to give general properties pertaining to these subjects without considering in detail the many factors contributing to the behavior of refractories in industrial furnaces.

Consider Factors in Slag Effects

Slag action would require specific information as to the composition of the slag, the atmosphere of the furnace, the temperature of operation, the manner in which the slag comes in contact with the brick, the mortar used for the joints, and many other factors. Silica brick, for example, are sensitive to spalling in a low-temperature range but at higher temperatures they show excellent resistance.

Behavior of refractories in the hot load test can seldom be interpreted in terms of service except where the refractory is heated on several sides. Studies have proved conclusively that when refractories are heated on one side only, the cooler portions of the brick have ample strength to support the load imposed in almost any furnace design. This condition, however, may not hold to its full extent in furnace construction where the refractories are unusually well insulated, with the result that a high temperature is present even at the back of the refractory wall.

Selection of the refractories most likely to give good service in furnaces where unusual conditions are encountered requires experience in judging the relative importance of the various properties of refractories. Often it is desirable to install different types of refractories, or modifications of types, in various areas of a furnace to obtain good average furnace life. This practice, however, is not necessary in a great many furnaces where conditions are relatively simple and where one type of refractory fulfills the requirements.

11. Expressed as Pyrometric Cone Equivalent (P.C.E.). A.S.T.M. requirement for *minimum* P.C.E.: Low duty cone 19 (2770 F); high duty cone 31-32 (3030 F); super duty cone 33 (3175 F). Refractoriness is also measured by amount of subsidence in the hot load test.
12. Varies, depending upon type; abrasion resistance better measure but no standard test developed.
13. Mean value. Range to cover various types; *at* 200 C $\pm$ 4.5 x 10^{-6}, and *at* 1000 C $\pm$ 9 x 10^{-6}.
14. Approximate range of data $\pm$ 1.5 B.t.u. resulting from methods used and property of materials.
15. Oxidizes but in reducing atmosphere sublimes above 3700 C.
16. Magnesia is amorphous, or crystalline (periclase), depending upon heat treatment.
17. Dissociates at very high temperatures.
18. Melts incongruently, forming corundum and siliceous liquid.
19. Synthetic, pure.
20. From a virtually pore-free body.
21. Clay-bonded (alumina 67%).
22. Called ganister (about 98% silica) in the trade and is used for manufacture of silica brick.
23. Quartz inverts to tridymite 870 C and tridymite to cristobalite 1470 C, the melting point is for the latter form.
24. Silica brick in temperature range 30 to 230 C.
25. Silica brick in temperature range 230 to 1000 C.
26. Silica refractories.
27. Softens about 1150 C.
28. Decomposition temperature, oxidation may start at 900 C.
29. Varies considerably with temperature.
30. Clay-bonded 90% silicon carbide.
31. Andalusite and kyanite are of the same chemical composition and all change to mullite plus silica upon heating.
32. "Stabilized" product.

SEVEN CHAPTERS HOLD APPRENTICE CONTESTS

SEVEN LOCAL APPRENTICE CONTESTS were held this year by Chapters of the American Foundrymen's Society in conjunction with the 1949 A.F.S. National Apprentice Contest. Those sponsoring local contests were the Northern California, St. Louis District, Washington, Wisconsin, Detroit, Northeastern Ohio and Eastern Canada & Newfoundland Chapters. Winners in gray iron, steel and non-ferrous molding and in patternmaking in each of these local contests were selected to represent their respective Chapters in the 1949 A.F.S. National Apprentice Contest, whose first place winners received cash awards and a trip to the 53rd A.F.S. Convention in St. Louis, May 2-5.

National contest winners were reported in the May issue, pages 50-53, and a story on local contests sponsored by the Wisconsin, Northern California and St. Louis Chapters appeared in the same issue on page 111. In addition to the Eastern Canada, Detroit, Washington and Northeastern Ohio Chapter contests reported below, many firms participated though they had only a single apprentice in the shop. Other foundries and pattern shops held plant contests to select their best apprentice for the national competition. Of the hundreds of local entries, 71 reached the final judging in St. Louis.

The Eastern Canada Chapter (until recently, Eastern Canada and Newfoundland), which in past years has provided many national contest winners, is the only chapter known to conduct a special elimination contest prior to the competition held to select entries in the national judging. Conducted at the Montreal (Que.) Technical School—the school figures largely in all Eastern Canada Chapter Education activities—the elimination contest was held January 29 and February 5 with 39 apprentices entered in gray iron and bronze molding and in patternmaking. In the elimination contest, patterns and blueprints are selected from those available at Montreal Technical School and local foundries. The standard apprentice contest pattern and blueprint used for final competition throughout the United States and Canada are used only in Eastern Canada Chapter's final contest.

In charge of the apprentice contest and all other phases of Eastern Canada's educational program was W. T. Shute, Canadian Car & Foundry Co., Ltd., chairman of the Chapter's Educational Committee.

For the third successive year the Detroit Chapter sponsored a patternmaking contest to select entries in the national contest. In an area where the greatest proportion of patterns are metal rather than wood, the contest nevertheless drew 16 apprentices. Competition was held at City Pattern Foundry & Machine Co. where judging also took place. Willard E. Kidwell of Packard was chairman of the Contest Committee.

Starting with a plant contest conducted a year ago for his apprentices at the Puget Sound Naval Shipyard, Bremerton, by Master Patternmaker E. J. McAfee, the Washington Chapter's contest grew to 36 entries this year. Mr. McAfee and William Gibb, a University of Washington metallurgical engineering student who was a molder for six years, conducted the 1949 contest for the Chapter.

Continued heavy interest in the A.F.S. Apprentice Contest characteristic of the Northeastern Ohio Chapter resulted in 11 entries, representing each of the four contest divisions, being sent to St. Louis for final judging. Of these, five won national prizes. National prize winners from Cleveland were: Chester J. Konopinski and Thomas H. Conrad, both of Fulton Foundry & Machine Co., who placed second and third, respectively, in gray iron molding; Elmer J. Turk, Wellman Bronze & Aluminum Foundry, first, and Donald Inman, Western Aluminum Match Plate Corp., second, non-ferrous molding; and Donald A. Siebert, Royal Pattern Works, second prize winner in the national patternmaking contest.

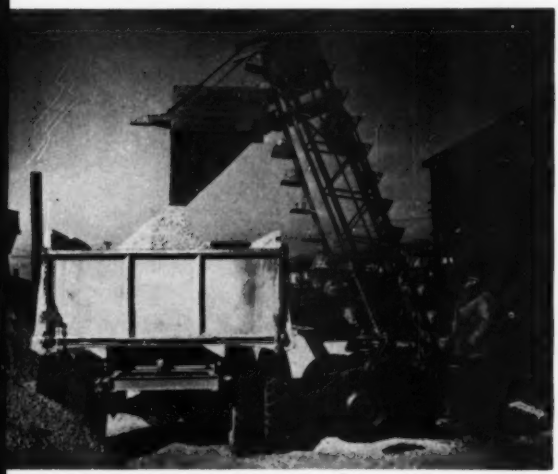
The Northeastern Ohio contest was conducted by Frank C. Cech and A. Sutowski, Cleveland Trade School, under the auspices of the Chapter and The Associated Industries. Chairman of the Foundry Group of Associated Industries is Charles F. Seelbach, Forest City Foundries Co.—for the Pattern Group the chairman is Frank J. Hrabek, East End Pattern Works.

Donors of prizes for Detroit's apprentice patternmakers contest (left to right) are: Harlan Arthur, Training Department, Ford Motor Co.; Ernest J. Ross executive secretary, Patternmakers Association of Detroit; Dave Martin, Apex Pattern and Engineering Co.; Jess Toth, Harry W. Dietert Co. and William Seese, J. S. McCormick Co.

PRODUCTS PARADE . . .

"AN EXHIBIT ON PAPER"

AMERICAN FOUNDRYMAN herein concludes a series of three articles designed to provide a showcase for the display of the newest developments in foundry equipment, materials and services at Convention time in a year when the biennial A.F.S. Foundry Congress and Exhibit is not held. On the pages of this "Exhibit on Paper" will be found the outstanding tools of the foundry craft that have been developed recently by the nation's equipment and materials manufacturers. More detailed information on the products described here can be obtained by filling in the coupon on Page 64. The first two sections of Products Parade appeared in the April and May issues of AMERICAN FOUNDRYMAN.



◀ 113. Car Unloader

A bucket-type elevator of tubular steel construction, the Markroy Co.'s car unloader transfers materials such as coal, sand, limestone, coke, etc., from hopper cars to truck or pile at the rate of 1½ to 2 tons per minute. Easily transported in a small pickup truck and operable by one man, the car unloader eliminates need for a concrete pit at trackside, does not disturb rail bed and does not require removal during location or movement of hopper cars. Patented continuous feed.

114. Jolt Control

Controlamix Co.'s new jolt control device, featuring electro-pneumatic timing, assures uniformity of molds. External adjusting knob is equipped with lock to prevent unauthorized change in jolting. Available as packaged unit with valve and heavy-duty button. Pilot and valve circuit insures operator safety.

115. Refractory Ramming Process ▶

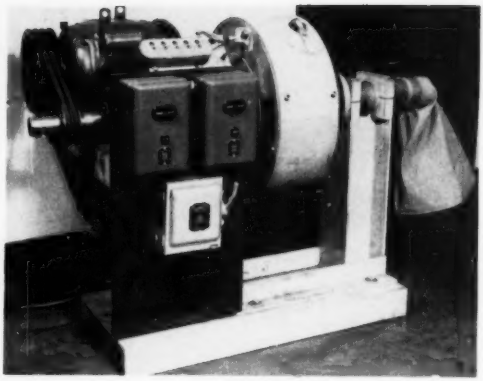
Eastern Clay Products, Inc.'s new Bondact process for the fast, mechanical ramming of refractory linings and patches, features the Bondactor, a pressurized machine which will meter and feed a dry refractory mixture at almost any desired rate or volume at any location convenient to an air line or compressor. The unit feeds ganister, crushed brick, silica sand or grog up to 5/16 in. maximum size uniformly and without pulsation, and has complete control over moisture content, thickness of lining and density of packing. Machine spray-hydrates mixture and deposits it instantly at high velocity on the lining wall, resulting in patch with uniform density and low moisture.

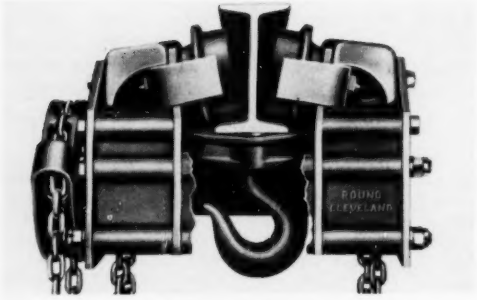
116. Fuel Oil Treatment

Dacarol A, a product developed by the Dacar Chemical Products Co., is an activated fuel oil treatment which attacks oil sludges and water condensation and provides more effective atomization and greater fuel release of any grade of fuel oil. Applied directly to storage tanks in proportionate dosages per 1000 gal of fuel oil, Dacarol A penetrates the entire body of oil within a few hours, resulting in cleaner tanks and lines and less carbon deposits in preheaters and on burner tips and less need for maintenance.

117. Shot & Grit Tester

Developed for rapid and accurate determinations of the value of metal and other abrasives, Alloy Metal Abrasive Co.'s shot and grit testing machine subjects material to conditions identical with those in a centrifugal blasting machine, and automatically returns the material through the wheel until an accurate determination can be made on the value of an abrasive in less than 20 minutes.





118. Hand Trolley Hoist

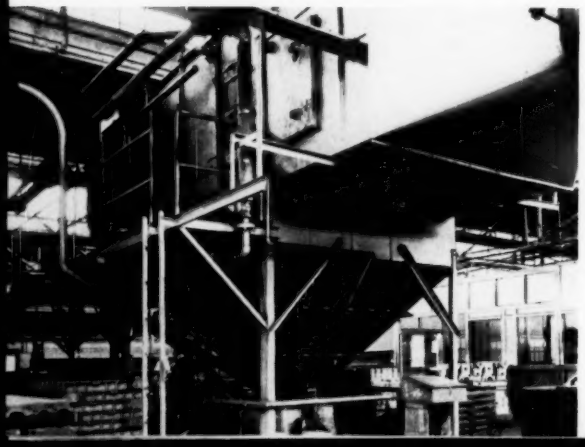
Fitting snugly around overhead beams, David Round & Son's line of Beam-Hugger trolley hoists is available in 13 sizes, from 1 to 24 ton capacities. When hook is raised to maximum height, shank touches base of beam and head room is reduced to length of hook only, adding to plant working space. Hoisting mechanism is of Auto-Bloc type. Gears carry lifetime guarantee.

119. Refractory Mortar

Mexico Refractories Co.'s Mex-Lox, a mortar for metal resistant linings, is claimed by its manufacturer to be: (1) slag and metal resistant; (2) erosion resistant; (3) non-shrinking; (4) spall resistant; (5) more refractory than most firebrick; (6) easily dipped or troweled; (7) resistant to deterioration.

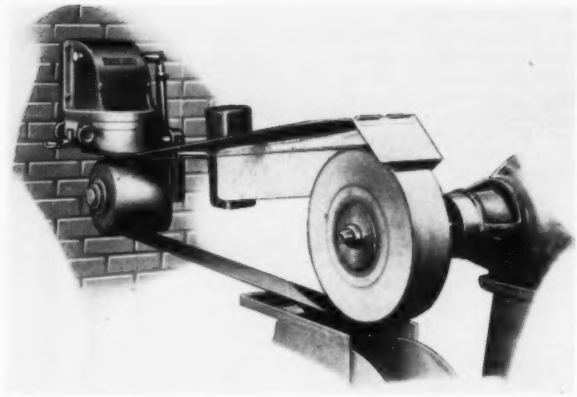
120. Brinell Hardness Testing Machine

Hand-operated, Steel City Testing Machines, Inc.'s Brinell hardness testing machine has a maximum production of 200 pieces per hour for making impressions and reading with microscope. Dead weight, multi-beam type. Finely ground knife edges and seats keep friction at a minimum. Weights calibrated for loads 3000, 2500, 2000, 1500, 1000, and 500 kg. Load is changed by removing or adding weights at rear of machine. Hydraulic dash pot eliminates shock on load. Unit is furnished with or without Brinell microscope, with micrometer scale and case.



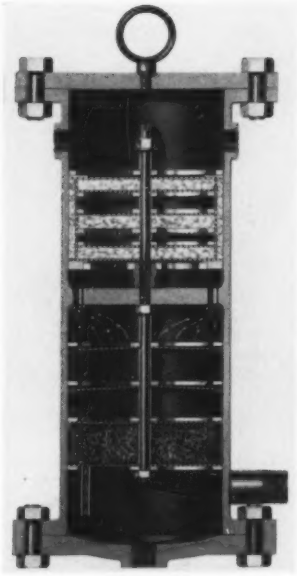
121. Static Washer

Buffalo Forge Co.'s static washer exhausts shakeout and sand handling operations at a rate of 40,50,000 cfm. All water is recirculated for eight hours, then sprayed through a sump and pumped away. Manometer measures resistances across the unit.



122. Backstand Idler

Two miles per minute belt speed is a feature of Porter-Cable Machine Co.'s backstand idler. Using coated abrasive belts, unit converts grinding and polishing lathes to high production belt grinders and polishers. Available in both floor and wall models, backstand idlers have fine-thread adjustments to prevent belt throw-off. Idlers are equipped with hydraulic safety devices to prevent belt breakage. Adjustable for right or left hand.



123. Oil Filter and Separator

Designed for use where compressed air must be entirely dry and free of dirt, James A. Murphy & Co.'s oil-filter super-separator can be used for such operations as the spraying of lacquer, paint and enamel, and is available in four sizes for ½, 1, 1½ and 2 in. pipe inlets. Alternate outlets provide for convenience in installation.

124. Drum Carrier Attachment

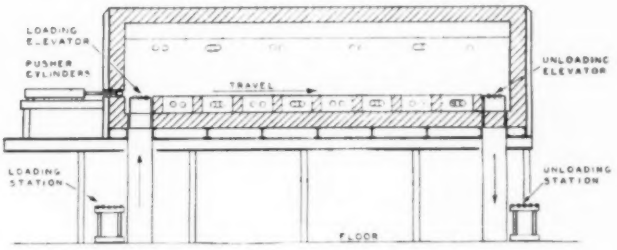
Designed to pick up, carry and tier two or four 55-gallon drums without the use of a pallet, Clark Equipment Co.'s multiple drum carrier device fits over the top of drums, lifts and moves them without need for a pallet. Unit is easily interchangeable with standard forks and easily installed.

125. Synthetic Resin Core Binder

A dry, thermosetting resin binder, Cycor 151, developed by the American Cyanamid Co., meets the requirements of aluminum, gray iron, steel and brass casting. Cycor 151 contains no fillers of any kind and is therefore readily adaptable to meet varied requirements for green and baked strength, hardness and collapsibility. This resin binder produces cores unaffected by high humidity and long lay-overs and makes it possible to bake large and small cores at the same time. Features: excellent collapsibility, can be cured at 350 F, adaptable to fuel-fired or dielectric core ovens.

126. Malleable Annealing Furnace

Holcroft & Co.'s controlled atmosphere, radiant-tube fired, malleable annealing furnace is elevated 7½ ft above floor level so that the area directly beneath the furnace can be used for working space. Stock is charged and discharged by elevators installed at both ends of the furnace, and is moved through the annealing furnace by hydraulic pushers.

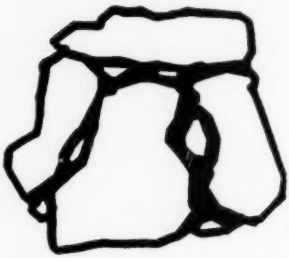


127. Blueprint Cabinet

Blueprints filed in Empire Development Corp.'s Draw-In-Dex cabinet hang smoothly and occupy a minimum of space. Cabinet accommodates up to 1,000 drawings, any of which can be removed or replaced quickly without disturbing the others. Complete with index cards and locks.

128. Cradle Type Crucible Tongs

A new line of cradle type crucible tongs and standard crucible shanks, developed by the Industrial Equipment Co., are available in all sizes and types. The tongs support the crucible in the same manner as a pouring shank, eliminating crushing and pinching. Easily handled and safe, these tongs can be quickly adjusted by means of single screw and locknut and give four point suspension.



129. Plastic Refractory

Premixed at the factory, Ramtite Co.'s plastic refractory is shipped dry and requires only the addition of water for use. Illustrated is cluster of DPM Ramtite. Each grog particle (white) has a coating of bond clay (black). DPM comes in three grades and can be stored indefinitely, cannot be damaged by drying atmospheres or freezing temperatures and is instantly available for emergency use.

130. Temperature Control Instruments

Combining conventional pyrometer control features with auxiliary devices for maintaining precision straight-line temperature control, Claud S. Gordon Co.'s Capacitrol (illustrated) and Capacilog are readily applied to any electric or fuel-fired furnace or oven. Automatic controls require no adjustment. Capacitrol indicates, and Capacilog records straight-line temperature control.

Products Parade, AMERICAN FOUNDRYMAN, *222 West Adams St., Chicago 6, Ill.*

Please send manufacturers' literature on the Products Parade items, indicated by circled numbers below, without cost or obligation to me.

113	114	115	116	117	118	119	120	121
122	123	124	125	126	127	128	120	130

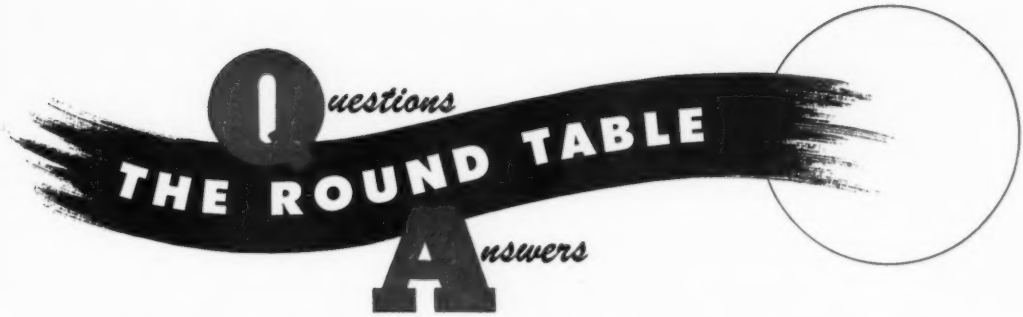
(PLEASE PRINT)

NAME _____ POSITION _____

FIRM _____

STREET _____

CITY _____ STATE _____



DOES BENTONITE SOFTEN SHELLAC?

We have had much grief with synthetic sands used for steel molding. Prior to the time when we began to use bentonite as a binder and were using other types of clay binders, we experienced no difficulty in withdrawing patterns from the molds without tearing. We were using pure shellac as a coating for the patterns.

With our present sand mixtures we have no success with shellac. I have advanced the theory that bentonite softens the coating sufficiently to allow the sharp silica sand grains to penetrate.

Patternmaker

Shellac is made by dissolving crusts from lac insects in alcohol. During the war many synthetic "shellacs" were sold as natural substances. If *Patternmaker* is certain that he has the same product as prewar shellac we can proceed with an analysis from there.

Shellac has poor water and heat resistance. It is thermoplastic, reversibly soluble in acetones, ketones and alcohol, and subject to water permeation. Unless the synthetic sand mixture is definitely more alkaline than the naturally bonded mixture because of the bentonite or other sand factors we cannot attribute shellac failure to the presence of bentonite.

Unless the synthetic molding sand mixture contains more moisture than the naturally bonded one (usually not the case) this factor must be eliminated.

Very often, synthetic sands are returned to the molding floor at a higher temperature than the naturally bonded sands used to be. This is due to press of production rather than any inherent characteristics of the two types of sands. Heat easily softens shellac thereby allowing the abrading by the sand grains. Abrasion will be more pronounced the more angular and sharper the grains.

Shellac-like materials which are less water permeable and more heat resistant than shellac are available.

O. J. Myers, *Fdry. Research Dir.*
Werner G. Smith Co.
Minneapolis

Local areas of high water concentration may exist in the mold. Since shellac is slightly soluble in water and becomes sticky in this condition these areas of excess water may cause the difficulty.

H. M. Kraner, *Ceramic Engineer*
Bethlehem Steel Co.
Bethlehem, Pa.

From the data we have gathered we believe it is impossible for a clay-like mineral to soften shellac. The softening action must come from some material which acts as a thinner to the shellac. This may come from the type of parting compound used or from fuel oil which may have been used in the preparation of the synthetic sand mixture.

We have found that a dry parting is better for use with shellac-coated patterns. For metal patterns we advocate a liquid parting. A liquid parting usually is composed of fuel oil, carbon tetrachloride and stearic acid. A very small amount of thinner in a liquid parting compound will soften or dissolve the shellac and cause sand to stick to it. Hot sand aggravates the condition.

Clyde A. Sanders, *Vice-President*
American Colloid Co.
Chicago

Shellac softens with a rise in temperature and on a pattern this may be due to two causes. First, shellac heats up when the pattern remains in the mold and, second, the sand may be warm or hot due to frequent use. If the latter is a problem the sand must be cooled or a larger volume used so that the sand does not circulate so fast. Special pattern coatings are available and these have been used with some success where patterns must stay in a mold for some time.

Bentonite has a definite heat of wetting and if improper sand mixing is practiced heat will be generated long after mixing, probably during molding. All clays have this property to some extent. In naturally bonded sand, nature has accommodated foundrymen by distributing the kaolinite very well. In preparing synthetic sands, foundrymen have a tendency to shorten excessively the mixing time. Incomplete distribution of bond and water and a temperature rise after mixing are the result.

Prof. D. C. Williams
Ohio State University
Columbus, Ohio

Bentonite and other clays used for binding synthetic sand are simply hydrated alumina silicates. They are inactive, chemically, and when bentonite is used there is a lower percentage of water present in the sand. I see no way in which any of these clays could attack a pattern coating. If bentonite softened a shellac coating, fireclay would do the same thing. Western

bentonite produces a sand which is slightly more sticky than that produced by other clays but most foundries seem to have no trouble due to this.

N. J. Dunbeck *Vice President*
Eastern Clay Products, Inc.
Jackson, Ohio

It is difficult to understand why bentonite should have any softening effect on a shellac coating. The trouble may be caused by a poor grade of shellac or possibly due to the difference in properties between a fireclay bonded sand and a bentonite bonded sand.

Synthetic sand bonded with bentonite would no doubt have a lower moisture content than the sand bonded with fireclay, and would probably also tend to be somewhat more brittle. The combined effect of lower moisture and less clay material in the sand might make it more difficult to withdraw the pattern from the mold without tearing the sand.

Bradley H. Booth *Foundry Engineer*
Carpenter Brothers, Inc.
Milwaukee

Memorial Resolution Honors Rintz

A MEMORIAL RESOLUTION honoring Martin Rintz who died April 7 (AMERICAN FOUNDRYMAN, May 1949, page 148) was formulated at the annual meeting of the Pattern Division in St. Louis, May 3, during the 53rd Annual Convention of A.F.S. Long prominent in the affairs of the Pattern Division, Mr. Rintz was a member of its Executive Committee and chairman of its Program Committee. A director of the Chicago Chapter, he was superintendent of Continental Foundry & Machine Co.'s No. 2 foundry.

Engineers Dedicate Headquarters

WESTERN SOCIETY OF ENGINEERS celebrated its 80th anniversary and dedicated its new headquarters at 84 East Randolph St., Chicago, in the John Crerar Library property, on May 25. Covering three floors, the new headquarters includes an auditorium accommodating 300 persons, staff offices and a lounge, and dining facilities.

Space selected for the Western Society's Engineering and Science Center was chosen because of its proximity to the 700,000 volume John Crerar Library. More than 30 technical groups are already using the Society's facilities and the number is expected to increase.

Discuss Nodular Graphite Iron

NODULAR GRAPHITE CAST IRON was the drawing card March 9 when 175 foundrymen gathered at the Engineers Club in Boston for dinner and a talk by Prof. Howard F. Taylor, Massachusetts Institute of Technology. Probably the largest gathering of the New England Foundrymen's Association in recent years, according to Walter M. Saunders, Jr., who reported the meeting, the turn-out indicated the interest of foundrymen in the speaker as well as in his subject.

Prof. Taylor described the English and American practices for producing nodular iron and showed slides illustrating microstructures and physical properties. Many questions were asked regarding applications and economic aspects of the new material.

Connecticut Non-Ferrous Meets

CONNECTICUT NON-FERROUS FOUNDRYMEN'S ASSOCIATION members met April 20 in New Haven, to hear Otto Osterman, Redford Iron and Equipment Co., Detroit, speak on *"Core Blowing for Small Foundries."* The meeting opened, according to technical minutes prepared by Charles A. H. Knapp, with a discussion of means of eliminating imperfections in small flat hardware castings.

In his talk, Mr. Osterman recommended mixtures for core blowing, methods of mixing and suggested using kerosene in the mixtures to prevent sticking and to make blowing easier. He discussed rigging of blowing equipment and said wood boxes could be used if vents and blowholes were properly located.

Meeting March 16 in New Haven, members of the Connecticut Non-Ferrous Foundrymen's Association discussed foundry problems. S. W. Chappell, Jr., Electric Boat Co., was discussion leader; Charles A. H. Knapp prepared technical minutes.

Major discussion topics were removal of tramp metal from sand systems, use of same sand in cores and synthetic sands, prevention of lumping in sand systems combining natural and synthetic sands, and use of diatomaceous earth for insulating risers and pads.

MIT Receives Shakeout

As part of a program to interest young men in foundry work a foundry shakeout was given to Massachusetts Institute of Technology by the manufacturer, Hewitt-Robins Inc., New York. Accepting the shakeout is (right) Howard F. Taylor, assistant professor of metallurgy; Audie P. DeVita, Hewitt-Robins Inc., is at left. The presentation is part of a program initiated four years ago by the Foundry Equipment Manufacturers Association. MIT has a student chapter of the American Foundrymen's Society and is a Foundry Educational Foundation school.

WHO'S WHO

H. J. Chamberland

H. J. Chamberland, author of *"Friction Saw Cuts Castings Cleaning Cost,"* Page 44, has been in the toolmaking industry since 1902, when he became an apprentice toolmaker with Morse Drill Twist Co. following graduation from business college . . . He is today research engineer for the DoALL Co., Des Plaines, Ill., and in addition is in business for himself as a consulting production engineer . . . Mr. Chamberland has written 350 articles on production appearing in 38 magazines, including 10 overseas publications . . . He is the author of *Contours*, published by the DoALL Co., and now in its 11th Edition, and of a series of 30 "Training for War" articles published during the war by *Popular Mechanics* magazine.

W. K. Bock

Dr. W. K. Bock, author of *"Collecting, Organizing, Analyzing Foundry Data,"* Page 53, holds three degrees from Case Institute of Technology, Cleveland—B. S. in 1931, M. S. in 1935, and Ph. D. in 1948 . . . While earning his degrees, Dr. Bock was with Bishop & Babcock Mfg. Co., Cleveland, from 1931 to 1934, and has been with the National Malleable & Steel Castings Co., Cleveland, since 1935, and is today resident engineer there . . . Dr. Bock has been a frequent speaker at meetings of technical societies and has written several articles for the technical press.

H. G. Sieggreen

Harold G. Sieggreen, author of *"Modern Foundry Methods,"* Page 40, is chief process engineer for the Central Foundry Division of General Motors Corp., Saginaw, Mich. . . . After serving a four-year apprenticeship in a Saginaw machine shop, Mr. Sieggreen joined GMC's Saginaw Malleable Iron Plant in 1931 . . . He has held, successively, positions as pattern shop foreman, maintenance foreman, production foreman, customer contact man and process engineer . . . A graduate of General Motors Institute's four-year engineering course, Mr. Sieggreen has been active in the A.F.S. Saginaw Valley Chapter, where he was a member of the Chapter's Educational Series Committee last year and is this year a member of the Program Committee.

George Krumlauf

George Krumlauf, author of *"Cast Figure Process Reduces Machining Costs,"* Page 50, is foundry superintendent for the Altens Foundry & Machine Co., Lancaster, Ohio . . . A graduate of the International Correspondence School's course in Industrial Metallurgy, he has attended Franklin University, Columbus, Ohio, and Ohio State University . . . Mr. Krumlauf joined the Westvaco Chlorine Products Co. in 1934 as a junior engineer, and a year later became research engineer for Battelle Memorial Institute, Columbus . . . He was appointed metallurgist in 1947 for Altens Foundry & Machine Works and is today foundry superintendent there. Mr. Krumlauf is a member of A.F.S., the Army Ordnance Association, and the American Society of Military Engineers.

H. L. Campbell

H. L. Campbell, author of *"Convert Ladle Dimensions to Iron Weight,"* Page 48, has written two well-known textbooks — *Metal Castings* and *The Working, Heat Treating and Welding of Steel* . . . Holder of a B.S. in Chemical Engineering (1914) and an M.S. in Engineering (1921) from the University of Michigan, Mr. Campbell has had extensive experience in both the industrial and educational phases of the foundry industry . . . It was while he was associate professor of Metal Processing at the University of Michigan from 1921 to 1936, that Mr. Campbell wrote the two above-named foundry textbooks . . . In 1936 he joined the American Hoist & Derrick Co., St. Paul, as metallurgist, leaving there a few years later to become metallurgist for the Western Foundry Co., Chicago . . . He is today consultant on foundry sand and core testing equipment for the Precision Scientific Co., Chicago . . . Mr. Campbell has served on technical committees of A.F.S., ASM and ASTM and has presented several technical papers before Chapter and National meetings of the American Foundrymen's Society.

D. M. McCutcheon

Don M. McCutcheon, author of *"Radioisotope Gage Indicates Liquid Metal Height in Cupola,"* Page 35, has been with Ford Motor Co., Dearborn, Mich., since 1935, specializing in laboratory work on radiography, x-ray diffraction and metallurgy . . . Since 1942, he has been supervisor of the Metallurgical Research section of Ford's Processing Engineering Laboratory . . . A member of several technical societies, Mr. McCutcheon is a past national president of the Society for Non-Destructive Testing, and is chairman of the Society of Automotive Engineer's Division on Non-Destructive Testing . . . Mr. McCutcheon is a frequent speaker before technical society groups throughout the country and has published a number of papers on radiography, x-ray diffraction, non-destructive testing and industrial uses of radioisotopes.

URGENTLY NEEDED!
VOLUME 48 (1940) TRANSACTIONS

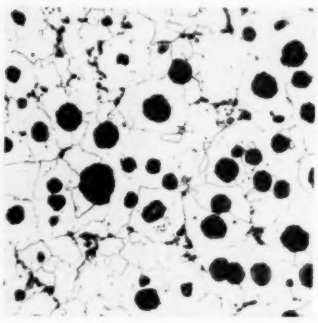
Bound copies of this volume in good condition will be purchased by A. F. S. Headquarters. Members who have no further use for their copies are urged to write The Secretary, American Foundrymen's Society, 222 W. Adams, Chicago, 6.

Letters to the Editor

Casts High Elongation Iron

The idea seems to prevail that nodular irons with ductility approaching or exceeding that of malleable irons can be obtained only by heat treatment of the magnesium or cerium treated irons. Contrary to this, we have produced in our foundry nodular irons which, as cast, have elongations of from 10 to 20 per cent.

The photomicrograph shows the general structure of an as-cast sand casting. As the matrix is essentially ferritic, good



General structure of as-cast sand casting. Nital etch, X150. Tensile strength, 75,000 psi; elongation, 13.1 per cent; BHN, 174.

ductility is obtained as-cast. Annealing produced only a small improvement in elongation. Chemical composition of the cupola melted iron illustrated is: C, 3.82 per cent; Si, 2.98 per cent; Mn, 0.32 per cent; S, 0.022 per cent; P, 0.01 per cent.

Ferritic nodular irons with good elongations have been obtained in castings having sections from ¼ to ⅝ in. and weighing up to 15 lb. Our first elongation values were obtained using a standard 0.505-in. diameter specimen of 2-in. gage length.

To obtain nodular structures, we have used nickel-magnesium and copper-magnesium alloys and pure magnesium as the nodularizing agent. Ferrosilicon, a silicon-manganese-zirconium alloy and ferrosilicon-zirconium have been used as inoculants to prevent the formation of undesirable carbides.

Experiments conducted in our foundry for the past two years indicate that zirconium alloys tend to aid the formation of nodular graphite and at the same time give some desirable physical properties. In very low sulphur irons partially nodular structures have been obtained using zirconium as the nodularizing element.

W. C. Jeffery, *Metallurgist*
Production Foundries Division
Jackson Industries Inc.
Birmingham, Ala.

Studied Early Blast Furnaces

Some time ago an article by Bruce L. Simpson of National Engineering Co., entitled *"Colonial Foundries in the New World"* was published in American Foundryman. This was of particular interest to me since I had the opportunity to do a considerable amount of research work on charcoal iron furnaces in southern Ohio while employed as metallurgist by the Jackson Iron & Steel Co. of Jackson, Ohio, several years ago.

Although in the article Mr. Simpson deals principally with the colonial iron furnaces in the eastern section of the country, it is a fact that at one time the section known as the "Hanging Rock District" of southern Ohio was a leading producer of charcoal pig iron.

The first furnaces built in that region would cast only one to two tons of iron per day, though later improvements increased this output to as high as 20 tons. The better ores in use contained from 30 to 40 per cent iron and were often found cropping out of the hillsides. In general, it took about 2¾ tons of ore to make one ton of iron. Only a small amount limestone, quarried from local deposits, was used. Charcoal was used for fuel, about 110 bushels being required in the smelting of one ton of iron.

Due to peculiar geological formations in southern Ohio, it was possible for operators of these early furnaces to dig their iron ore, limestone and fireclay from the same hillside. Charcoal, of course, was readily available from the heavily wooded hills in that area.

Most charcoal furnaces operated with only one tuyere. The photograph shows that there are two openings in the base of the typical stone furnace stack. The large triangular opening in the front is where the iron was tapped out and in the smaller opening on the side the single tuyere was located.

Casts were made once or twice a day, and iron flowed from the furnace tap hole, down runners, through sows and into sand pig molds. When broken from the sows, the pigs would weigh from 50 to 200 lb and were rough and uneven in appearance. They were sanded while hot, quenched and carried to a wagon for transfer to stockpiles.

In each case the furnace was located on the side of a hill. This allowed room for the stockhouse and stockpiles of raw materials to be located above the furnace. It was common practice to build a trestle from the top of the hill to the top of the furnace and stock was wheeled over in buggies and dumped into the furnace. This is well illustrated by the diorama on display at the Chicago Museum of Natural History and which has been reproduced as one of the pictures accompanying Mr. Simpson's article.

Bradley H. Booth
Foundry Engineer
Carpenter Brothers, Inc.
Milwaukee

"*Colonial Foundries in the New World*," which appeared in the September, 1948, issue of *American Foundryman*, pages 24-31, was taken from Mr. Simpson's book *Development of the Metal Castings Industry* published last year by the American Foundrymen's Society. —*Editor*

Remains of early American blast furnace in the "Hanging Rock District."

New AFS MEMBERS

NEW SUSTAINING MEMBER

Bonney Floyd Co., Columbus, Ohio—R. E. Fisher, Pres., Conversion from Company Member (Central Ohio Chapter).

NEW COMPANY MEMBERS

Defiance Plant, Central Foundry Div., General Motors Corp., Defiance, Ohio—Arthur M. Clark (Toledo Chapter).

Omaha Semi Steel Foundry Co., Omaha, Nebraska—Joe D. Duffield.

Lone Star Steel Co., Dallas, Texas—E. B. Germany, Pres. (Texas Chapter).

Florida Foundry & Pattern Works, Miami, Florida—E. H. Opfer, Prop. (Birmingham Chapter).

BIRMINGHAM CHAPTER

John F. Drenning, Met. Sls. Engr., Ketchner, Marshall & Co., Birmingham, Ala.
J. Robert Kattus, Met., Anderson Brass Works, Inc., Birmingham, Ala.
Florida Foundry & Pattern Works, Miami, Florida (E. H. Opfer, Prop.).

CENTRAL ILLINOIS CHAPTER

William C. Oliver, Fdy. Appr., Caterpillar Tractor Co., Peoria, Ill.

CENTRAL NEW YORK CHAPTER

N. Harold Boardman, Asst. Mgr., Elmira Works, General Electric Co., Elmira, N. Y.

CENTRAL OHIO CHAPTER

Bonney-Floyd Co., Columbus, Ohio (R. E. Fisher, Pres.).
Robert J. Nekervis, Battelle Memorial Institute, Columbus, Ohio.
William F. Riley, Trader, Luria Bros. & Co., Inc., Cleveland.

CHICAGO CHAPTER

Robert E. Dineen, Sls. Repr., Velsicol Corp., Chicago.
George H. Feustel, Asst. Supt., The Pyle-National Co., Chicago.
John M. Frey, Dist. Mgr., The Girdler Corp., Thermex Div., Chicago.
Thaddeus J. Glaza, Asst. Maint. Engr., Crane Co., Chicago.
Julius Roeder, Asst. Met., Chicago Steel Foundry Co., Chicago.
Robert R. Stoffer, Sls. Engr., United States Rubber Co., Chicago.

CINCINNATI CHAPTER

Erroll V. Black, Met., The Duriron Co., Inc., Dayton, Ohio.
Edward Cibulka, The Duriron Co., Inc., Dayton, Ohio.

DETROIT CHAPTER

Wayne H. Buell, Dir. of Res., Aristo Corp., Detroit.
John F. Ewing, Student, University of Michigan, Ann Arbor, Mich.
Thos. B. Hayes, Melt. Fmn., Div. King Seely, Central Specialty Co., Ypsilanti, Mich.
Gerard H. Hilbers, Jr., Student (Met. Engrg.), University of Michigan, Ann Arbor, Mich.

EASTERN CANADA CHAPTER

J. B. Atkinson, Asst. Plt. Supt., Sorel Steel Foundries Ltd., Sorel, Que., Canada.
G. Ronald Brown, Mgr., Morash Foundry Ltd., Morrisburg, Ont., Canada.
Edward Pickford, Fmn., Morash Foundry Ltd., Morrisburg, Ont., Canada.
Ian Gordon Steward, Sls. Repr., P. N. Soden & Co. Ltd., Montreal, Que., Canada.
Chuck Wondolowski, Fdy. Tech., Singer Mfg. Co., St. Jean, Que., Canada.

EASTERN NEW YORK CHAPTER

Charles Day Silva, Appr., American Locomotive Co., Schenectady, N. Y.

METROPOLITAN CHAPTER

John H. Garger, Jr., Vice Pres. & Secy., High Frequency Fdy. Sls. Corp., New York.
Nat Levin, Pres., High Frequency Fdy. Sls. Corp., New York.
James P. Moran, Vice Pres. & Treas., High Frequency Fdy. Sls. Corp., New York.

MO-KAN CHAPTER

Harry A. Brown, Plt. Supt., Griffin Wheel Co., Kansas City, Kan.
James Emert Morgan, Pres., Enterprise Foundry Corp., Kansas City, Mo.
K. S. Patton, Slsmn., Mexico Refractories Co., Kansas City, Mo.

NORTHEASTERN OHIO CHAPTER

Wesley F. Lewis, Asst. to Tech. & Res. Dir., Steel Founders' Society of America, Cleveland.
Clarence J. Stewart, Sls. Mgr., The Federal Foundry Supply Co., Cleveland.
E. J. Woolmington, Sls. Repr., The Nock Fire Brick Co., Cleveland.

NORTHERN CALIFORNIA CHAPTER

Wilbur F. Nauman, Clng. Rm. Fmn., Vulcan Steel Foundry, Oakland, Calif.

NORTHWESTERN PENNSYLVANIA CHAPTER

E. W. Strong, Proprietor, E. W. Strong, Distributor, Erie, Pa.

ONTARIO CHAPTER

John A. Madden, Sls. Engr., Aluminum Co. of Canada, Ltd., Toronto, Ont., Canada.

OREGON CHAPTER

Fred W. Bechtel, Fdy. Supt., Klamath Iron Works, Klamath Falls, Ore.
Francis L. Weber, Master Mechanic, Electric Steel Foundry, Portland, Ore.

PHILADELPHIA CHAPTER

Richard W. Haag, Vice Pres., North Wales Foundry Co. Inc., North Wales, Pa.

QUAD CITY CHAPTER

William Frederick Voeks, Ind. Sls. Engr., Carborundum Co., Cedar Rapids, Iowa.

ST. LOUIS DIST. CHAPTER

Joseph M. Carbonara, Dist. Sls. Repr., Hercules Powder Co., St. Louis, Mo.
Howard C. Close, Dist. Mgr., Machinery & Welder Corp., St. Louis, Mo.

SOUTHERN CALIFORNIA CHAPTER

Walter H. Dunn, Process Engr., Solar Aircraft Co., San Diego, Calif.
Roland E. Schluer, Regional Mgr., Precision Grinding Wheel Co., Alhambra, Calif.

TENNESSEE CHAPTER

Richard E. Kirchmayer, Dist. Mgr., Sterling Wheelbarrow Co., Chattanooga, Tenn.
Joe Lone Milburn, Educational Dir., Combustion Engrg., Superheater Co., Chattanooga, Tenn.
L. Bayne Stanton, Chief Ind. Engr., United States Pipe & Foundry Co., Chattanooga, Tenn.

TEXAS CHAPTER

J. J. Chandler, V. P. & Wks. Mgr., Tyler Pipe & Foundry Co., Tyler, Texas.
John G. Collier, Fdy. Supt., Garrott Brass & Machine Co., Houston, Texas.
Lone Star Steel Co., Dallas, Texas (E. B. Germany, Pres.).
E. Wilson Germany, Special Repr., Lone Star Steel Co., Dallas, Texas.
J. M. Hollingsworth, Sls. Repr., Lone Star Steel Co., Dallas, Texas.
Van Vliet Lyman, Sls. Repr., Simonds Abrasive Co., Houston, Texas.
J. Roderick McAlpin, Sls. Repr., Lone Star Steel Co., Houston, Texas.
John M. Morris, Sls. Repr., Lone Star Steel Co., Dallas, Texas.

TIMBERLINE CHAPTER

Edward L. Michael, Slsmn., Joseph Dixon Crucible Co., Denver, Colo.
Warren C. Prosser, Dist. Mgr., Federated Metals Div., American Smelting & Refining Co., Denver, Colo.

TOLEDO CHAPTER

Defiance Plant, Central Fdy. Div., General Motors Corp., Defiance, Ohio (Arthur M. Clark).
Gladwell W. Davison, Fmn., National Supply Co., Toledo, Ohio.

TRI-STATE CHAPTER

D. W. McArthur, Gen. Fdy. Fmn., Oklahoma Steel Castings Co., Tulsa, Okla.
Ernest M. Newland, Sls. Engr., Oklahoma Steel Castings Co., Tulsa, Okla.

WESTERN NEW YORK CHAPTER

Boyd H. Work, Asst. Sls. Mgr., The Carborundum Co., Niagara Falls, N. Y.

STUDENT CHAPTERS

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Donald B. Brah Ronald L. Greene

MISSOURI SCHOOL OF MINES

Vernon G. Berkey Calvin A. Hoeffler Floyd Hoffman

OHIO STATE UNIVERSITY

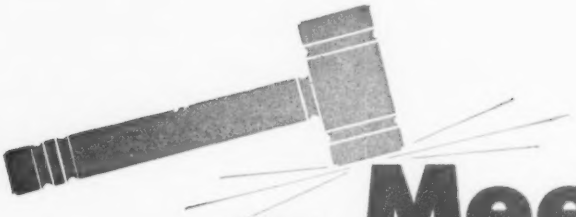
John Xavier Matyskella John M. Roberts

OUTSIDE OF CHAPTER

Leonard B. Bergman, Omaha Semi Steel Foundry Co., Omaha, Nebr.
Omaha Semi Steel Foundry Co., Omaha, Nebr. (Joe D. Duffield, Gen. Mgr.).

India

The Librarian, The Tata Iron & Steel Co., Ltd., Jamshedpur, India.



Chapter Meetings

JUNE 17
OREGON
Heathman Hotel, Portland
INSTALLATION OF OFFICERS

JUNE 18
QUAD CITY
Camp Nobel on Rock River near Moline, Ill.
ANNUAL OUTING

CENTRAL MICHIGAN
Waterworks Park, Coldwater, Mich.
ANNUAL OUTING

DETROIT
Forest Lake Country Club
ANNUAL JUNE OUTING

JUNE 21
EASTERN NEW YORK
Circle Inn, Lathams Corners
ROUND TABLE MEETINGS

JUNE 24
NORTHEASTERN OHIO
SUMMER OUTING

JUNE 25
WESTERN NEW YORK
Sturms Grove, Genessee St., Buffalo
ANNUAL STAG OUTING

JUNE 27
NORTHWESTERN PENNSYLVANIA
Moose Club, Erie
A. ALLEN SULCOWE
Pennsylvania State Employment Service
"Employment in Pennsylvania Foundries"

JULY 23
TOLEDO
El Rancho, near Toledo
ANNUAL PICNIC

JULY 25
TWIN CITY
Midland Hills Country Club, St. Paul
ANNUAL GOLF PARTY

AUGUST 12
CENTRAL OHIO
Brookside Country Club, Columbus
ANNUAL OUTING

AUGUST 27
ONTARIO
Barnesdale, Watertown, Ont.
ANNUAL PICNIC

Future Meetings and Exhibits

INSTITUTE OF BRITISH FOUNDRYMEN, 46th annual conference, Cheltenham Spa, England—June 14-17.

MALLEABLE FOUNDERS' SOCIETY, annual meeting, Homestead Hotel, Hot Springs, Va.—June 16-17.

AMERICAN SOCIETY FOR TESTING MATERIALS, annual meeting, Atlantic City, N. J.—June 27-July 1.

INSTRUMENT SOCIETY OF AMERICA, 4th national instrument exhibit, St. Louis Municipal Auditorium, St. Louis—Sept. 12-16.

NEW ENGLAND REGIONAL FOUNDRY CONFERENCE, Massachusetts Institute of Technology, Cambridge, Mass., Oct. 7-8.

AMERICAN SOCIETY FOR TESTING MATERIALS, Pacific Coast Meeting, Fairmount Hotel, San Francisco—Oct. 10-14.

STEEL FOUNDERS' SOCIETY OF AMERICA, fall meeting, Ambassador Hotel, Los Angeles—Oct. 13-14.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION, annual meeting, The Greenbrier, White Sulphur Springs, West Virginia—Oct. 13-15.

AMERICAN SOCIETY FOR METALS, metal congress and exposition, Public Auditorium, Cleveland—Oct. 17-21.

REGIONAL FOUNDRY CONFERENCE, Metropolitan, Philadelphia and Chesapeake Chapters of A.F.S., Stevens Institute of Technology, Hoboken, N. J., Oct. 21-22.

NATIONAL SAFETY COUNCIL, 37 National Safety Congress and Exposition, Chicago, Oct. 21-28.

GRAY IRON FOUNDERS' SOCIETY, annual meeting, Edgewater Beach Hotel, Chicago—Oct. 27-28.

NATIONAL FOUNDRY ASSOCIATION, annual meeting, Waldorf-Astoria Hotel, New York—Nov. 9-11.

MICHIGAN REGIONAL FOUNDRY CONFERENCE, A.F.S. Michigan Chapters, Michigan State College, East Lansing—Nov. 15-16.

NEW YORK STATE REGIONAL FOUNDRY CONFERENCE, A.F.S. Upstate New York Chapters, Syracuse University, Syracuse, N. Y.—Nov. 25-26.

54th Annual Foundry Congress and Exhibit, American Foundrymen's Society, Public Auditorium, Cleveland. May 8-12, 1950.

Chapter Officers and Directors

J. A. Bowers
American Cast Iron Pipe Co.
Birmingham
Director
Birmingham District Chapter

H. J. Bauman
Beloit Iron Works
Beloit, Wis.
Director
No. Ill.-So. Wis. Chapter

C. T. Greenidge
Battelle Memorial Institute
Columbus, Ohio
Director
Central Ohio Chapter

W. T. Shute
Canadian Car & Foundry Co.
Westmount, Que.
Director
Eastern Canada Chapter

C. S. Humphrey
C. S. Humphrey Co.
Moline, Ill.
Director
Quad City Chapter

G. J. Nock
Nock Fire Brick Co.
Cleveland
Director
Northeastern Ohio Chapter

P. L. Arnold
U. S. Pipe & Foundry Co.
Chattanooga, Tenn.
Vice-Chairman
Tennessee Chapter

Jack Richardson
United Smelting & Refining Co.
Hamilton, Ont.
Director
Ontario Chapter

F. G. Vargas
Consulting Metallurgist
President
Mexico City Chapter

L. C. Kimpal
Rochester Gas & Electric Corp.
Rochester, N. Y.
Secretary-Treasurer
Rochester Chapter

E. J. McAfee
Puget Sound Naval Shipyard
Bremerton, Wash.
Director
Washington Chapter

F. A. Austin
Crown Iron Works
Minneapolis
Chairman
Twin City Chapter

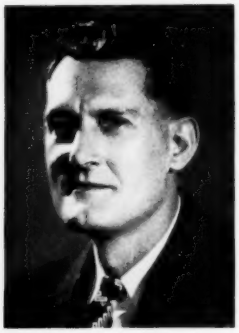
FOUNDRY Personalities

Changes in executive foundry personnel recently announced by the Mackintosh-Hemphill Co., Pittsburgh, are: **G. A. Lorz,** to be superintendent of operations at the Garrison plant, Pittsburgh; **C. R. Hodgson,** to be superintendent of the Midland, Pa., plant; **O. B. Douthett,** to be Garrison general foundry foreman; **O. Feicht,** to be Midland general foundry foreman; and **Walter J. Johnson,** to be assistant plant manager at Garrison.

Philadelphia Brass & Bronze Corp. announces the following officers and directors elected at a recent meeting of the Board of Directors: chairman of the Board, **Charles E. Schley;** president, **Donald Bryden;** vice-president, **Gordon E. Keim.** Directors: **F. R. Hensel, Ray F. Sparrow, George Schmidt, Arthur Kitson,** and Messrs. **Schley, Bryden** and **Keim.** It was also announced that P. R. Mallory & Co., Inc., of Indianapolis, has acquired financial interest in the company.

Richard H. Olmsted, formerly sand control supervisor for Lake City Malleable, Inc., Ashtabula, Ohio, has accepted an appointment as service engineer for Whitehead Bros. Co., Detroit, and will cover the company's midwestern territory. Mr. Olmsted is a member of the A.F.S. Sand Shop Course Committee.

Thornton C. Bunch, since 1940 Master Molder at the Pearl Harbor, Hawaii, Naval Shipyard, was recently appointed Master Molder at the Mare Island Naval Shipyard, Vallejo, Calif. Holder of a B.S. in Metallurgical Engineering from the New Mexico School of Mines in 1935,



T. C. Bunch

Mr. Bunch received his professional degree as Metallurgical Engineer in 1938. Prior to attending the School of Mines, Mr. Bunch served as an apprentice molder at the Norfolk Naval Shipyard.

George V. Luerssen, chief metallurgist for the Carpenter Steel Co., was recently the recipient of the first annual David Ford McFarland Award of the Penn State Chapter of the American Society for Metals. The award was presented by Dr. McFarland at the Chapter's May 12 dinner meeting to Mr. Luerssen as a "Penn State metallurgist who has attained such eminence in his profession as to have brought credit upon his Alma Mater."

In recognition of 60 years of continuous service with the Allis-Chalmers Mfg. Co., Milwaukee, John A. Leisk (right), general superintendent of foundries and pattern shops, was recently presented with a certificate by Harry E. Ladwig, foundries and pattern shops works manager. Mr. Leisk started with the company in 1889 as a molder's helper. He is a native of Lerwick in the Shetland Islands, Scotland.

William A. Muth, Jr., formerly vice-president and general manager of the Aluminum Permanent Mold Co., Cleveland, has been appointed Ohio representative for the Wellman Bronze & Aluminum Co., Cleveland. Mr. Muth, a graduate of John Carroll University has been in the foundry industry since 1936.

Louis T. Friedman, assistant professor of Engineering at Champlain College, has been appointed head of the Metallurgical Engineering department of Sam Tour & Co., New York. Mr. Friedman was formerly plant metallurgist for Moldcast Products Co., and Eastern Metal Products Co.

George W. Altman, newly-appointed foundry engineer for the National Radiator Co., Johnstown, Pa., will rotate among the company's foundries as a consultant on metallurgical and engineering problems. Mr. Altman operated foundries in England and in Aachen, Germany, as a member of the Army Engineering Corps in World War II.

At the annual meeting of stockholders of Acme Aluminum Alloys, Inc., Dayton, Ohio, **B. D. Claffey,** formerly executive vice-president and general manager of the corporation, was elected president, succeeding **Karl A. Stein,** who was elected chairman of the Board of Directors. **Robert J. Stein** replaced **George H. Stein,** who continues as vice-president, and member of the Board. **R. C. Crouch** was re-elected secretary and treasurer.

Harry M. Foster, formerly foundry foreman of the Milwaukee Works of the International Harvester Co., was recently appointed assistant foundry superintendent of the Louisville Works of International Harvester. Mr. Foster joined Harvester in 1946 and has been connected with the foundry industry for 28 years.

Dr. Max Hansen, distinguished German metallurgist, became senior metallurgist in the Non-Ferrous section of the Armour Research Foundation's Metals department as of June 1. Dr. Hansen, who has been an associate professor of Metallurgical Engineering at Armour since November, 1947, came to this country from Germany in 1947 after completing a compilation

Max Hansen

of German scientific progress for the United States Military Government. From 1937 through 1945, Dr. Hansen was director of research for Durener Metallwerke, Duren, Germany.

Harrison Taylor has been appointed sales engineer in the New York office of the Whiting Corp., succeeding **A. R. Binckes,** who was recently transferred to the company's Los Angeles office.

A. W. Anderson, vice-president of the Claud S. Gordon Co., Chicago, resigned effective April 30 after 31 years' service with the company. Mr. Anderson, a pioneer in modern heat treating and pyrometry, retired because of ill health.

A recent visitor to A.F.S. Headquarters, Chicago, was **V. Jobson,** chairman of the Board of Directors of Qualcast, Ltd., Derby, England, and director of Allied Ironfounders, Ltd., London.

E. H. Doering

Four promotions at the top management level are announced by the Maumee Malleable Castings Co., Toledo, Ohio. They are: **E. H. Doering,** since 1945 general manager, to be executive vice-president; **N. P. Mahoney,** formerly production manager and superintendent, to be plant manager; **R. E. Bossert,** manager of the Pattern department, to be sales manager; and **H. M. Breese,** company treasurer and purchasing agent, will assume the post of secretary in addition to his other duties.

Visitors from England to the A.F.S. Headquarters, Chicago, last month included four iron foundrymen who have been visiting American jobbing iron foundries, inspecting molding machines and other equipment adaptable to their specialized types of production. They are: **Leslie Mortlock,** director, Hill & Son, Ltd., Manchester; **J. B. Briggs,** director, Tower Foundry, Ltd., Leicester; **Dr. Alex Ivanoff,** director, Hayward-Tyler & Co., Ltd., Bedfordshire; and **Charles E. Lay,** foundry director, John Jones & Sons, Ltd., Loughborough.

Edwin S. Carman, founder and for 20 years president of Edwin S. Carman, Inc., foundry engineers and consultants, has been elected chairman of the Board of Directors. He will be succeeded as president by Thornton S. Carman, general manager of the company.

George A. Meisinger, formerly in charge of market research for the Velsicol Corp., recently joined the staff of the Trabon

(Continued on Page 88)

A. F. S. CHAPTER DIRECTORY

BIRMINGHAM DISTRICT CHAPTER *Secretary-Treasurer,* F. K. Brown, Adams, Rowe & Norman, Inc. 729 Brown-Marx Bldg., Birmingham, Ala.

BRITISH COLUMBIA CHAPTER *Secretary-Treasurer,* Howard Brownrigg, British Columbia Res. Council Met., Hut #01, University of B.C., Vancouver, B. C., Canada

CANTON DISTRICT CHAPTER *Secretary,* Paul H. Muntz, United Engineering & Foundry Co., 1400 Grace Ave., N. E. Canton, Ohio

CENTRAL ILLINOIS CHAPTER *Secretary-Treasurer,* Robert E. Dickison, Brass Foundry Company, 713 S. Adams, Peoria, Ill.

CENTRAL INDIANA CHAPTER *Secretary,* Paul V. Faulk, Box 16, Clayton, Ind.

CENTRAL MICHIGAN CHAPTER *Secretary-Treasurer,* David Sherman, Engineering Castings Inc., Marshall, Mich.

CENTRAL NEW YORK CHAPTER *Secretary,* William D. Dunn, 432 Buckingham Ave., Syracuse, N. Y.

CENTRAL OHIO CHAPTER *Secretary,* D. E. Krause, Gray Iron Research Institute, 1532 Cardiff Rd., Columbus, Ohio

CHESAPEAKE CHAPTER *Secretary-Treasurer,* Clausen A. Robeck, Gibson & Kirk Co., Warner & Bayard Sts., Baltimore 30, Md.

CHICAGO CHAPTER *Secretary,* G. J. Biddle, Illinois Clay Products Co., 608 S. Dearborn St., Chicago

CINCINNATI DISTRICT CHAPTER *Secretary,* Burt A. Genthe, S. Obermayer Co., 647 Evans St., Cincinnati, 4.

DETROIT CHAPTER *Secretary,* J. N. Phelps, Vanadium Corp. of America, 2440 Book Tower, Detroit

EASTERN CANADA CHAPTER *Secretary,* J. G. Hunt, Dominion Engineering Works, Ltd., P. O. Box 220, Montreal, Que., Can.

EASTERN NEW YORK CHAPTER *Secretary-Treasurer,* Leigh M. Townley, Adirondack Foundries & Steel Co., Watervliet, N. Y.

METROPOLITAN CHAPTER *Secretary,* J. F. Bauer, Hickman, Williams & Co., 70 Pine St., New York

MEXICO CITY CHAPTER *Secretary,* N. S. Covacevich, Apartado 1030, Mexico, D. F., Mexico

MICHIANA CHAPTER *Secretary-Treasurer,* J. Paul Jordan, Dodge Mfg. Corp., Mishawaka, Ind.

MO-KAN CHAPTER *Secretary,* C. W. Myers, Jr., Morton-Myers Co., P. O. Box 1039, Kansas City, Mo.

NORTHEASTERN OHIO CHAPTER *Secretary,* A. J. Harlan, Hickman, Williams & Co., 1154 Union Commerce Bldg., Cleveland, O.

NORTHERN CALIFORNIA CHAPTER *Secretary,* Charles R. Marshall, Industrial Foundry Supply Co., 1434 Howard St., San Francisco

NORTHERN ILLINOIS-SOUTHERN WISCONSIN *Secretary,* Carl L. Dahlquist, 120 So. Highland, Rockford, Ill.

NORTHWESTERN PENNSYLVANIA CHAPTER *Secretary,* Earl Strick, Erie Malleable Iron Co., Erie, Pa.

ONTARIO CHAPTER *Secretary-Treasurer,* G. L. White, Westman Publications, Ltd., 137 Wellington St. W., Toronto, Ont., Canada

OREGON CHAPTER *Secretary-Treasurer,* Harry K. McAllister, 627 S. E. 71st Ave., Portland, Ore.

PHILADELPHIA CHAPTER *Secretary-Treasurer,* W. B. Coleman, W. B. Coleman & Co., 9th & Rising Sun Ave., Philadelphia

QUAD CITY CHAPTER *Secretary-Treasurer,* C. R. Marthens, Marthens Co., 3091½ 16th St., Moline, Ill.

ROCHESTER CHAPTER *Secretary-Treasurer,* Leon C. Kimpal, Rochester Gas & Electric Corp., 89 East Ave., Rochester, N. Y.

SAGINAW VALLEY CHAPTER *Secretary-Treasurer,* Raymond H. Klawuhn, General Foundry & Mfg. Co., P. O. Box 119, Flint, Mich.

ST. LOUIS DISTRICT CHAPTER *Secretary,* P. E. Retzlaff, Busch-Sulzer Bros.-Diesel Engine Co., Div. Nordberg Mfg. Co., 3300 S. Second St., St. Louis

SOUTHERN CALIFORNIA CHAPTER *Secretary,* Harold G. Pagenkopp, Angelus Pattern Works, 2084 Belgrave Ave., Huntington Pk., California

TENNESSEE CHAPTER *Secretary-Treasurer,* Herman Bohr, Jr., Robbins & Bohr, Chattanooga Bank, Chattanooga, Tenn.

TEXAS CHAPTER *Secretary,* P. B. Croom, 5210 Canal, Houston, Texas

TIMBERLINE CHAPTER *Secretary,* James Schmuck, Rotary Steel Castings Co., 1425–5th St., Denver, Colorado

TOLEDO CHAPTER *Secretary-Treasurer,* R. C. Van Hellen, Unitcast Corp., Box 8, Station E, Toledo, Ohio

TRI-STATE CHAPTER *Secretary,* D. A. Mitchell, Progressive Brass Co., 1702 East 6th, Tulsa, Okla.

TWIN-CITY CHAPTER *Secretary-Treasurer,* Lillian K. Polzin, Minneapolis Chamber of Commerce, 1750 Hennepin at Groveland Terrace, Minneapolis

WASHINGTON CHAPTER *Secretary,* F. R. Young, E. A. Wilcox Co., 517 Arctic Bldg., Seattle 4, Wash.

WESTERN MICHIGAN CHAPTER *Secretary,* Ross Shaffer, Lake Foundry & Machine Co., First & Water Sts., Muskegon, Mich.

WESTERN NEW YORK CHAPTER *Secretary,* R. E. Walsh, Hickman, Williams & Co., 32 Eastwood Place, Buffalo, N. Y.

WISCONSIN CHAPTER *Secretary,* G. E. Tisdale, Zenith Foundry Co., 1501 So. 83rd St., West Allis, Wis.

STUDENT CHAPTERS

MASSACHUSETTS INSTITUTE OF TECHNOLOGY *Secretary-Treasurer,* Robert N. Randall

UNIVERSITY OF ILLINOIS *Secretary,* Eugene Keith Van Ness

UNIVERSITY OF MINNESOTA

MISSOURI SCHOOL OF MINES *Secretary,* Martin L. Slawsky

OHIO STATE UNIVERSITY *Secretary-Treasurer,* Arthur Stoner

OREGON STATE COLLEGE *Secretary,* Leonard M. Preston

TEXAS A & M COLLEGE *Secretary,* Victor C. Henkel

♦40

♦7

CHAPTER ACTIVITIES NEWS

Western New York

Roger E. Walsh
Hickman, Williams & Co., Inc.
Chapter Reporter

A TALK AND FILM on industrial safety were the highlights of the April 15 meeting held at the Shearton Hotel, Buffalo. Speaker of the evening was Professor Daniel H. Gray, University of Buffalo, who discussed the *"Human Factor in Industrial Safety."* The speaker was introduced by O. V. Guenther, head of the Mechanical and Metallurgical department, New York State School of Applied Arts and Sciences, Buffalo, technical chairman of the Chapter.

Professor Gray cited familiar routine, poor eyesight, poor equipment and monotonous repetition as major causes of accidents. These factors can be avoided by screening of prospective employees, according to Professor Gray. Some persons, he said, are "accident prone", and must be placed in positions where they are not likely to be subject to accidents. Aptitude tests should be made to match the individual to the job, he added.

Mechanical labor today, Professor Gray said, is divided into jobs of high-degree specialization for greater productivity. This often results in monotonous jobs and the worker becomes careless, causing accidents. Men should be rotated on jobs, the speaker said, because variety and the sense of doing something significant gives the worker a sense of individuality and of "belonging"—instead of the feeling that he is an unimportant part of a huge machine.

Professor Gray further cited fatigue rest periods and shifting of jobs to counteract monotony as effective tools in raising employee morale. Following Professor Gray's talk, there was a discussion period and the showing of a film on industrial safety practices.

Taking part in an informal discussion following the April 11 meeting of the Massachusetts Institute of Technology A.F.S. Student Chapter are, left to right, Richard J. Wolf, Stone & Webster Engineering Corp., Student James O'Keefe, Speaker James Lansing, technical director, Malleable Founders' Society, and Students Warren Larson, Roland Ruetz and Ken McGrath.

Tri-State

F. E. Fogg
Acme Foundry & Machine Co.
Chapter Secretary

A.F.S. NATIONAL PRESIDENT W. B. Wallis was guest of honor at the Chapter's April meeting, held at the Alvin Hotel, Tulsa, Okla.

At a meeting of the Chapter's Board of Directors, held preceding the regular meeting, Mr. Wallis explained current policies and procedures of the Society.

The principal speaker of the evening was R. J. Rice of the International Nickel Co., Houston, Texas, whose topic was *"Alloys."*

In his talk, Mr. Rice outlined the physical properties and engineering qualities of cast iron and bronze alloys.

Massachusetts Institute of Technology

Richard L. Poirier
Technical Secretary

THE APRIL DINNER MEETING, held Wednesday evening, April 13 on the MIT campus, featured as its speaker James C. Lansing, technical and research director of the Malleable Founders' Society, Cleveland.

In order to give his audience an overall picture of the malleable iron industry, Mr. Lansing displayed several malleable castings and cited their toughness, resistance to shock and machineability as the primary reasons for the widespread use of malleable castings in industry today.

Illustrating his talk with slides, the speaker gave a brief account of the technical and metallurgical problems involved in producing malleable castings. The meeting concluded with a question-and-answer and discussion period.

Eastern New York

John M. Jones
American Locomotive Co.
Publicity Chairman

THE APRIL 19 MEETING, held at the Circle Inn, Lathams Corners, was to have had as its speaker Lyle L. Clark, Buick Motor Division, General Motors Corp., Flint, Mich.,

Foundrymen of the Eastern Canada & Newfoundland Chapter were hosts at their annual Ladies' Night, April 28 at Mount Royal Hotel, Montreal.

but Mr. Clark was delayed enroute and was unable to attend.

Day Kutler, sales manager, J. S. McCormick Co., Pittsburgh, substituted for Mr. Clark, speaking on cupolas and their operation, in which he stressed the value and use of free air. Following Mr. Kutler's talk, Chapter members participated in a question-and-answer and discussion period.

Tennessee

Carl A. Fischer, Jr.
Fischer Supply Company
Chapter Reporter

"FOUNDRY SANDS" was the subject of an address given by Clyde A. Sanders, American Colloid Co., Chicago, at the April 15 meeting at the Hotel Patten, Chattanooga. G. Frank Anderson, chairman, presided and Karl Landgrebe, vice-chairman, introduced the speaker.

Mr. Sanders said that economy in the foundry starts in the sand pile; that customers are now much more critical of castings than they were, and are rejecting castings with hair lines; whereas they formerly accepted them without question.

Controlled sand is very important now and is one of the most important problems before the foundry trade, he said. Sands are now being blended more satisfactorily to save bentonites and give better castings. Mr. Sanders said that southern bentonite is coming into its own more every day; that formerly many firms misused it with bad results but they are now using it properly and getting better flowability and less cracks.

Mr. Sanders illustrated his entire talk with tubes of sand mounted on a charted board, and with slides. A question and answer period was held at the conclusion of the talk.

Guests introduced at the meeting were L. H. Green, Vance Iron and Steel Co.; L. E. Chester, American Brake Shoe Co., and Robert Hale, E. I. Du Pont De Nemours Co.

Chesapeake

Jack H. Schaum
National Bureau of Standards
Chapter Reporter

FEATURED SPEAKER at the April 22 meeting, held at the Engineers' Club, Baltimore, was O. J. Myers of the Werner G. Smith Co., Minneapolis. Mr. Myers' talk on "*Cores*" was illustrated with slides showing results of various research projects on the subject.

Mr. Myers pointed out that cores are essentially 95 per cent sand. The remaining 5 per cent is binder, he continued, and of this 3 per cent is water, 1 per cent core oil, and 1 per cent cereal.

The speaker went on to outline the various functions of core oils and cereal binders in coremaking, and described the results of research conducted by his company on cores and core oils.

British Columbia

Norman Terry
Canadian Sumner Iron Works, Ltd.
Chapter Reporter

X-RAY EQUIPMENT, its development and applications to modern industry, was the subject of a talk given by Dr. Webster J. Daly of Daly Industrial X-Ray Systems, Los Angeles, at the April 19 meeting.

One of the outstanding uses of x-ray equipment in industry, as explained by Dr. Daly, was in the

A large audience of foundrymen and their guests turned out to hear Clyde A. Sanders, American Colloid Co., Chicago, (standing, center) speak at the April 11 meeting of the Central Ohio Chapter, held at the Bancroft Hotel, Springfield, Ohio. (Photograph courtesy W. H. White, Jackson Iron & Steel Co.)

R. J. Rice, International Nickel Co., Houston, Texas, left, looks on as A.F.S. Past National President Dan M. Avey, Avey Products Co., Tulsa, and National President W. B. Wallis compare Presidential experiences at Tri-State Chapter's April meeting. Chapter Chairman Dale Hall is at right.

manufacture of airplanes in World War II. One aircraft company, he said, examined more than 88,000 castings with x-ray equipment.

Dr. Daly demonstrated the x-raying of various types of castings, to prove the simplicity of the operation and to show how the process detects hidden flaws.

Most of the success of industrial x-ray as applied to metals was proved to be due to the close co-operation between the x-ray technicians, those who designed and built the equipment, and the actual engineers and metallurgists working in the various foundries. From Dr. Daly's experience it was more practical and advantageous to have the x-ray equipment located in the plant where the castings were being produced so that any defects, flaws or mistakes in the castings, could be located by x-ray promptly, and corrections inaugurated immediately before similar defective castings were produced.

Central Ohio

H. W. Lownie, Jr.
Battelle Memorial Institute
Chapter Reporter

ABOUT 100 MEMBERS attended the May 9 meeting to hear Nathan Janco, Centrifugal Casting Machine Co., Tulsa, Okla., discuss *"Centrifugal Casting."*

Mr. Janco gave a general description of the centrifugal casting process, as applied to gray iron, steel and non-ferrous metals. The differences between true centrifugal casting and semi-centrifugal or centrifuged castings were described and illustrated. A number of examples of castings produced by both methods were shown in slides, and typical centrifugal casting machines were described by the speaker.

The advantages of centrifugal casting in promoting directional solidification, reducing cold shuts, and reducing dirt defects were discussed. It was pointed out that by intelligent application of the process, many foundries have been able to appreciably increase casting yield and reduce casting rejects. The process is being generally applied for the casting of all metals except malleable iron and the light alloys. For effective utilization of the process in production, it is essential that hot metal be available for practically continuous pouring during the day. The machines are quite adaptable and each machine can be used to produce a rather wide range of casting sizes and types with very little time required for changeover. An active discussion followed the formal presentation by Mr. Janco.

No technical meetings are scheduled for the chapter for June or July. The annual picnic will be held in August.

Central Michigan

A. J. Stone
Albion Malleable Iron Co.
Chapter Reporter

THE APRIL MEETING, was held at the Union building of Michigan State College, East Lansing, and opened with a program of music furnished by a saxophone quartet from the East Lansing High School.

Professor C. C. Sigerfoos, Michigan State College, presided and Loren G. Miller, Dean of Engineer-

Photographed during the May dinner meeting of the Tennessee Chapter were, seated, left to right, Chapter Vice-Chairman Karl Landgrebe, The Wheland Co.; Speaker Clyde A. Sanders, American Colloid Co., Chicago; and Chapter Chairman G. Frank Anderson, Chattanooga Implement & Mfg. Co. Standing, left to right, are B. Greiser of Ross Meehan Foundry Co.; and Paul Arnold of the U. S. Pipe & Foundry Co., Chattanooga.

ing at Michigan State College, gave a welcoming address.

The technical session consisted of a talk on *"The Casting Customer's Point of View"* which was discussed by A. A. Wiedman, Chief Inspector, Detroit Diesel Engine Division, S. A. Clapp, Chief Inspector, Detroit Transmission Division, and H. J. Havermale, Chief Inspector, Truck and Coach Division, General Motors Corp.

Mr. Havermale opened the discussion by stating that in most cases machine scrap has decreased to pre-war levels and in some cases has gone below these levels.

Mr. Clapp outlined the procedure for establishing the contract on a new job or a new source on an old job. He emphasized very strongly that close contact between the foundry and the purchaser of castings is extremely beneficial to both parties from the standpoint of quality control.

Mr. Wiedman said that poor castings cause increased costs both to the user and the supplier of castings. He also emphasized the importance of casting dates on castings for the benefit of closer control. Statistical quality control was especially stressed as an important tool in decreasing manufacturing costs.

Wisconsin

W. W. Edens
Badger Brass & Aluminum Foundry Co.
Chapter Secretary

THE APRIL 8 MEETING, held in the Crystal Ballroom of the Schroeder Hotel, Milwaukee, was divided into sectional meetings.

Dr. J. A. Ridderhoff, Frederick B. Stevens Co., Detroit, spoke to the Gray Iron Group on *"Foundry Facing."* Harold Sohner, International Harvester Co., and Leslie Woehlke, Grede Foundries, Inc., were chairman and co-chairman, respectively, of the group.

The Steel Group had as its speaker Clyde A. Sanders of the American Colloid Co., Chicago, who discussed the *"Importance of Sand Density in Steel Foundry Molds."* Victor Ziemer, Maynard Electric Steel Castings Co., was chairman, with Gene Schneider, Grede Foundries, Inc., as co-chairman of the group meeting.

Malleable Group speaker was B. C. Yearly, National Malleable & Steel Castings Co., Cleveland, who spoke on *"Cracks in Ferrous Castings."* Paul Anderson, International Harvester Co., and Bert Stone, Belle City Malleable Iron Co., Racine, were co-chairmen.

Kurt Miericke, U. S. Gypsum Co., Chicago, spoke to the Non-Ferrous Group on *"Making Aluminum Match Plates in Plaster."* Arthur Tooman, Racine Aluminum & Brass Foundry Co., Racine, and John Kammermeyer, Federated Metals Division, American Smelting & Refining Co., were chairman and co-chairman.

The Pattern Group meeting featured a *"Review of the Season's Topics,"* a discussion by the Pattern Group Program Committee, led by Chairman Albert Huebner, Allis-Chalmers Mfg. Co., and Co-Chairman Leonard Gratz of the G & O Pattern Works.

Theodore Mordaunt, General Refractories Co., Milwaukee, spoke to the Technical Group on the subject: *"Super-Duty Refractories for Foundry Use."*

Western Michigan

S. H. Davis
Campbell, Wyant & Cannon Foundry Co.
Chapter Secretary

THE LAST MEETING of the season was held May 9 at the Cottage Inn, Muskegon and featured a smorgasbord dinner, election of officers, and an extemporaneous talk by Zigmund Madacey, Caterpillar Tractor Co., Peoria, on *"Modern Core Blowing and Core Practice."* There

This group of Twin City foundrymen heard A.F.S. National Director-Elect V. J. Sedlon, Master Pattern Co., Cleveland, speak at the April 7 meeting, reported in the May issue. (Photograph courtesy Pufahl Foundry, Inc.)

At the speakers' table at Central Illinois Chapter's May meeting were, left to right, Chapter Chairman-Elect Charles W. Bucklar, Jr., Superior Foundry Co., East Peoria, Ill.; the speaker, R. G. McElwee, Vanadium Corp. of America, Detroit; and Retiring Chapter Chairman Frank W. Shipley.

At the April meeting of the A.F.S. Wisconsin Chapter were, left to right, James A. Hughes and speaker of the evening Dr. J. A. Ridderhof, both of Frederic B. Stevens, Inc., Detroit, and Harold K. Sohner of the International Harvester Co. (Photo: W. V. Napp, Badger Firebrick & Supply Co.)

were 88 foundrymen present.

In addition to the election of officers for the 1949-50 season, Rolfe Jenkins of Campbell, Wyant & Cannon Foundry Co., Muskegon, was appointed Chapter staff photographer and editor, to help the Chapter secretary prepare publicity releases for AMERICAN FOUNDRYMAN and other publications.

The date of the Chapter's Annual Summer Picnic will be determined at a Chapter Board of Directors meeting later this month.

Quad City

C. R. Marthens
Marthens Co.
Secretary-Treasurer

THE APRIL 18 MEETING, held at the Fort Armstrong Hotel, Rock Island, Ill., featured as its speaker Charles B. Schureman of the Baroid Sales Division of the National Lead Co., Chicago.

Speaking on *"How About Becoming Sand Conscious?"*, Mr. Schureman said that foundry sand technique is not an exact science, and for this reason, there is usually more than one way of solving a particular sand problem.

Mr. Schureman outlined the various steps employed in selecting sands and bonding clays, mixing, methods of control and mechanical equipment. The speaker further emphasized the importance of employing skilled workers as sand mixer operators and of paying them high wages.

Improper core baking accounts for a large proportion of defective castings, the speaker said. He concluded by citing close check of baking time, temperature and uniformity as a means of obtaining maximum good casting results.

Cincinnati District

B. A. Genthe
S. Obermayer Co.
Chapter Reporter

"PLASTIC PATTERNS" was the subject of a talk given by C. R. Simmons, Durez Plastics and Chemicals, Inc., North Tonawanda, N. Y., at the May 9 meeting, held at the Engineering Society.

Mr. Simmons' talk covered the making and applications of plastic patterns and was augmented by slides showing variations in the types of patterns made with phenolic resin. Mr. Simmons actually constructed several plastic patterns during the course of his talk, using an accelerator.

The speaker stressed such advantages of plastic patterns as ease of duplication, finishing and repatching. Plastic patterns, Mr. Simmons said, can be made at a comparatively low cost.

Patterns can be made of plaster, wood, rubber or latex, the speaker said, and went on to describe the advantages of each when used in making plastic patterns.

Michiana

S. F. Krzeszewski
American Wheelabrator & Equipment Corp.
Publicity Chairman

THE LAST MEETING of the 1948-49 season was held at the Elkhart Hotel, Elkhart, Ind., on April 5 and was attended by 120 members.

The meeting opened with a program of barber shop harmony provided by the Doctors of Harmony, former national champions.

The first order of business was a report of the nominating committee, announcing the results of the election of officers and directors for the year 1949-50.

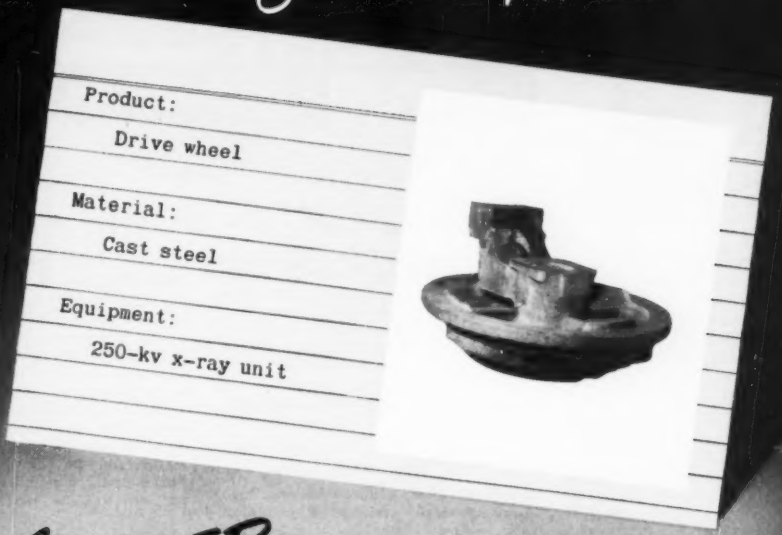
Those elected to office are:

Chairman—V. S. Spears, American Wheelabrator & Equipment

(Continued on Page 84)

Tablemates at the April 22 meeting of the Chesapeake Chapter at the Engineers' Club, Baltimore, were, left to right, W. C. Dodds, American Radiator & Standard Sanitary Corp., William Mehner, Cleveland Flux Co.; Charles Schildt, The Frick Co.; and R. E. Martin of Pangborn Corp.

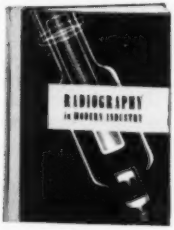
What's the right X-Ray film?



ANSWER:

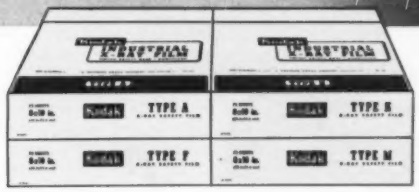
KODAK INDUSTRIAL X-RAY FILM, TYPE F

Because the equipment had only moderate power and section thicknesses up to 3¼ inches were to be examined, the radiographer chose Kodak Industrial X-ray Film, Type F, exposed with Kodak Industrial X-ray Intensifying Screens. This film is designed for use with fluorescent screens to provide maximum speed. The combination is essential in boosting equipment capacity to handle a heavy job like this. And, since the examination is for gross defects, speed is more important than sensitivity to very fine detail.



RADIOGRAPHY IN MODERN INDUSTRY

A wealth of invaluable data on radiographic principles, practice, and technics. Profusely illustrated with photographs, colorful drawings, diagrams, and charts. Get your copy from your local x-ray dealer—price $3.



A TYPE OF FILM FOR EVERY PROBLEM

To provide the recording medium best suited to any combination of radiographic factors, Kodak produces four types of industrial x-ray film.

Type F gives the highest available speed and contrast when exposed with calcium tungstate intensifying screens. Has wide latitude with either x-rays or gamma rays, exposed directly or with lead screens.

Type M provides high contrast and exceptional detail under direct exposure or with lead-foil screens. It has extra-fine grain, and speed is adequate for radiography of light alloys at moderate kilovoltages and for much million-volt work.

Type A offers high contrast with about three times the speed of Type M, but with slightly more graininess. Used direct or with lead-foil screens for study of light alloys at lower kilovoltages, and of heavier steel parts at 1,000 kv and with gamma rays.

Type K has medium contrast with high speed. For gamma ray and x-ray work where highest possible speed is needed at available kilovoltage without use of intensifying screens.

EASTMAN KODAK COMPANY
X-ray Division · Rochester 4, N. Y.

"Kodak" is a trade-mark

Radiography

another important function of photography

Kodak

FOUNDRY Literature

Readers interested in obtaining additional information on items described in Foundry Literature should send requests to Reader Service, American Foundryman, 222 W. Adams St., Chicago 6, Ill. Refer to the items by means of the convenient code numbers.

Non-Ferrous Alloys

JN101—Two new releases in the series of research papers from the laboratories of Silverstein & Pinsof, Inc., are now available to foundrymen, metallurgists and others interested in analytical methods. *"Polarographic Analysis of Zinc Die Casting Alloys"* covers the specific application of the Polarograph to the analysis of high-purity zinc die casting alloys. Theory and instrumentation are thoroughly discussed. *"Rapid Determination of Tin in Copper Base Alloys"* discusses the shortcomings and difficulties of past procedures in furnace control work, and describes a new method developed by Sipi technicians. Tabulated results and detailed information on solutions, set-up and procedure are given. Copies are available free of charge in handy binder form.

Silica Cement

JN102—Tayco-40, a water-retaining, high silica specifically designed to bond silica and super-duty silica brick and shapes, is described in a six-page illustrated folder recently issued by the Chas. Taylor & Sons Co. Described are properties, chemical content, softening point, advantages and applications.

Sand Conditioners

JN103—Beardsley & Piper Division of Pettibone Mulliken Corp.'s four-page Bulletin No. 1315 describes the operating principles, specifications and applications of three models of the Screenarator, a portable sand conditioner which can be moved to any floor in the foundry, plugged into a power outlet, and which screens, double aerates and discharges sand. Also described are the Mulbaro, a small portable muller, and the Nite-Gang, which completely conditions up to 40 tons of sand per hour with one man operation.

Pattern Gating Material

JN104—Key Co.'s Flexi-Gate, a patented material that may be applied to any desired curve in pattern gating, is described in a new four-page illustrated folder. The

★ Sharper Castings
★ Greater Brinell Hardness
★ Increase Tensile Strength
★ Increase Transverse Strength
★ Increase Wear Resistance
★ Increase Heat Resistance

Copper Shot

IMPROVES YOUR IRON

ALTER COMPANY Fifty Years of Service

1791 Rockingham Road, Davenport, Iowa

An A.F.S. Publication . . .

Recommended Practices for NON-FERROUS ALLOYS

Information contained in this important A.F.S. publication has been compiled by the Recommended Practices Committee of the A.F.S. Brass and Bronze Division, and the Committees on Sand Casting of the A.F.S. Aluminum and Magnesium Division. A book that provides non-ferrous foundrymen with accurate, up-to-date data for the production of practically any non-ferrous alloy casting, and enables them to check present production practices against accepted standards and wide experience. An indispensable reference work wherever non-ferrous metals are cast . . . compiled by many leading foundrymen and metallurgists. Contains 159 pages, 42 tables, 35 illustrations; cloth bound.

Some of the VALUABLE INFORMATION in this book . . .

Melting Practice . . . Finishing Practice . . . Melting and Pouring . . . Heat Treatment . . . Causes and Remedies of Defects . . . Properties and Applications

For the following alloys:

• Leaded Red and Leaded Semi-Red Brasses. • Leaded Yellow Brass. • High-Strength Yellow Brass and Leaded High-Strength Yellow Brass (Manganese Bronze). • Tin Bronze and Leaded Tin Bronze. • High-Lead Tin Bronze. • Leaded Nickel Brass and Bronze Alloys (Silicon Bronze). • Aluminum Bronze. • Aluminum-Base Alloys. • Magnesium-Base Alloys.

$2.25 to A.F.S. Members

ORDER YOUR COPIES PROMPTLY!

For better vented cores

Here's the time-proven—foundry-proven way to provide properly vented cores. Buffalo Brand Vent Wax comes in three shapes and eighteen sizes—ready to save you costly casting losses.

FREE SHOP CAPS

We'll gladly send you a supply of shop caps. Sizes 7, 7¼, 7½. Send us your request.

UNITED COMPOUND COMPANY

328 South Park Avenue Buffalo 3, New York

STANDARD HORSE NAIL CORPORATION
CHILL KOOLHEAD NAILS
COLD FINISHED HOT FORGED

STEEL • BRASS • STAINLESS
ALUMINUM • "KOOLHEAD SPIDER CHILLS" • HORSE SHOE NAILS

Chill nails for every purpose

STANDARD HORSE NAIL CORP.
SINCE 1872
New Brighton, Pennsylvania

Do You Know?
You can speed production up to 600%.... ....cut costs 75% with...
TAMASTONE
THE PERFECT PATTERN COMPOUND
Write for facts!
TAMMS SILICA CO.
228 N. La Salle St., Chicago 1, Ill.

folder explains reasons why Flexi Gate effects time savings up to 70 per cent, saves on labor and application costs. Procedures of application are outlined and sizes and prices are given.

Resin Binder

JN105—A revised edition of Hercules Powder Co.'s 33-page booklet on Truline powdered natural resin binder is available to readers AMERICAN FOUNDRYMAN free-of-charge. The booklet covers such general properties of the binder as weight, storage, mixing, moisture, baking, moisture resistance, and its reactions with drying oils, coal tar pitch, reclaimed sand and silica flour and clay. In addition, Truline binder's applications to steel, gray iron, malleable iron and brass foundry work, and its bulking values for core binders are thoroughly covered. Charts and diagrams provide detailed core mixing and baking information. Concluding the booklet is a description of Hercules' Truline binder laboratory facilities.

Corrosion-Resistant Alloys

JN106—A new bulletin, "*Solving Corrosion Problems with Chemi-alloy High-Alloy Castings*," is available upon request from the Electro-Alloys Division of the American Brake Shoe Co. A six-page folder, this bulletin features two charts designed to help in selecting the right alloy for most corrosive conditions. A "quick selector" shows the comparative corrosion resistance of the most commonly used grades in 179 different corrosive media. The bulletin also includes a list of standard corrosion-resistant alloys showing ACI types, AISI types and Chemalloy grades, with their nominal composition, mechanical properties and descriptions of each.

Air-Operated Tool Chart

JN107—A new chart, prepared by Buckeye Tools Corp. and compiled from the results of thousands of tests made under typical operating conditions, graphically points out means of getting maximum production from air-operated tools. This informative factual chart explains the power loss and consequent loss of air tool productivity caused by the use of incorrect air hose and coupling. Available free-of-charge.

CLASSIFIED ADVERTISING

A. F. S. Employment Service

Firms desiring to contact applicant are requested to write A.F.S. Headquarters, 222 West Adams St., Chicago 6, designating Item Number and issue. Please use company letterhead.

POSITIONS WANTED

PW111—Metallurgist or Superintendent: 10 years experience in gray iron metallurgy and supervision; molding, melting, pouring, mechanical maintenance. Jobbing and production castings, ½ lb to 8 tons; machine tools, agricultural, automotive, pressure castings. Know cupola operation, fuel substitution, natural and synthetic sands, facing materials, all types molding equipment. Chemical engineering degree. Available immediately for research or production.

PW116 — Foundry Metallurgist: Available now. Melting supervision and metallurgical experience involving cupolas, converters, electric furnaces and open hearths; iron and steel foundries. Supervision of metallurgical, chemical, physical and sand laboratories. Versed in scrap reduction through quality control and standardization of molding, coremaking and melting. Graduate degree in metallurgy. Age 33, married.

PW117—Foundry Superintendent or Metallurgist: Wide experience (23 years) in gray iron jobbing foundries on castings up to 20 tons, both as superintendent and as metallurgist. Thoroughly familiar with estimating, cupola operation, green and dry sand molding, gating and risering, and sand control. M.S. degree in metallurgy.

FOR SALE

All or any parts of Complete Foundry Equipment for making Cast Iron Welding Rod. Includes Whiting Cupola, Muller, Bins, Elevator, Conveyor, Roller Conveyor Sections, 2 Jolt Squeezers, Patterns, Flasks and Miscellaneous Items.

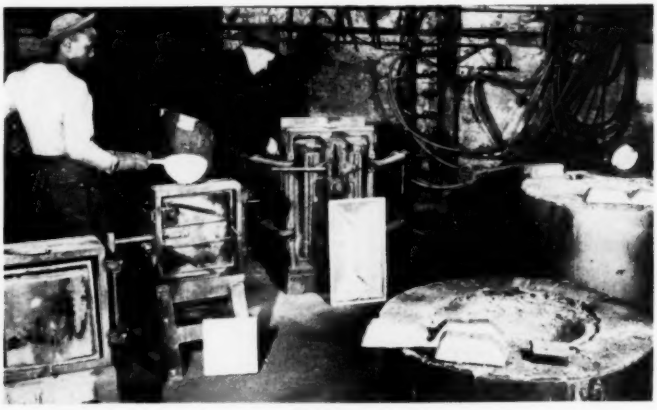
TALBERT CONSTRUCTION EQUIPMENT CO.
7950 West 47th St. Lyons, Ill.

FOUNDRY FIRM Facts

Federated Metals Division of the American Smelting & Refining Co., New York, was recently host during March and April to groups of metallurgical students from the University of Minnesota and Penn State College. The Minnesota students, under the leadership of Professors A. E. Martin and W. F. B. MacKay, visited Federated's Whiting, Ind., plant, where A. S. Wigle, plant superintendent, directed the inspection. The Penn State students made their annual tour of the Newark, N. J., plant at the invitation of Samuel Turkus, Jr., manager. The group was accompanied by Professors Harold J. Read and H. M. Davis.

Featured in the April issue of *Pen and Inco*, internal house organ of the **International Nickel Co.**, New York, is a story on the history and work of the company's Development and Research Division. The company's work in this field began in 1906, when a Columbia University instructor was employed to discover uses for Inco's then-new alloy, Monel. Today, the Division employs more than 200 persons and is sponsoring several outside research projects in addition to those being carried on at the Bayonne, N. J., plant. The Division has been responsible for the development of many new alloys and metallurgical processes.

Interior view of part of Federal Foundry Supply Co.'s new warehouse and sales office at 2507 24th St., Detroit, which will also house manufacturing facilities for such items as foundry riddles, skim gates, etc.



The 600-lb furnaces shown at right in this photograph were designed and built by the Wellman Bronze & Aluminum Co., Cleveland, for use in its permanent mold castings division. The furnaces, which are charged with liquid metal from larger tilts, have a capacity of up to 600 molds a day.

J. M. Frey Co., 624 S. Michigan, Chicago, has been organized by Mr. Frey to handle industrial equipment for foundries, plastics, woodworking and other industries. He will continue to handle Thermex high frequency core baking equipment and other core room equipment. The newly formed company will serve foundries and other industrial plants in Minnesota, Iowa, Wisconsin, Michigan, most of Illinois and part of Indiana.

Nugent Sand Co., has added two new sands to its line of lake and crude sands, according to G. W. Cannon, Jr., president, and Wm. J. Cannon, secretary-treasurer. Designated graded coarse and graded fine, the sands have average grain finenesses of about 39 and 55, respectively.

American Brake Shoe Co., sales amounted to $29,957,451 during the quarter ending March 31, it was reported by William B. Given, Jr., president, at the company's Annual Stockholders' Meeting, April 26.

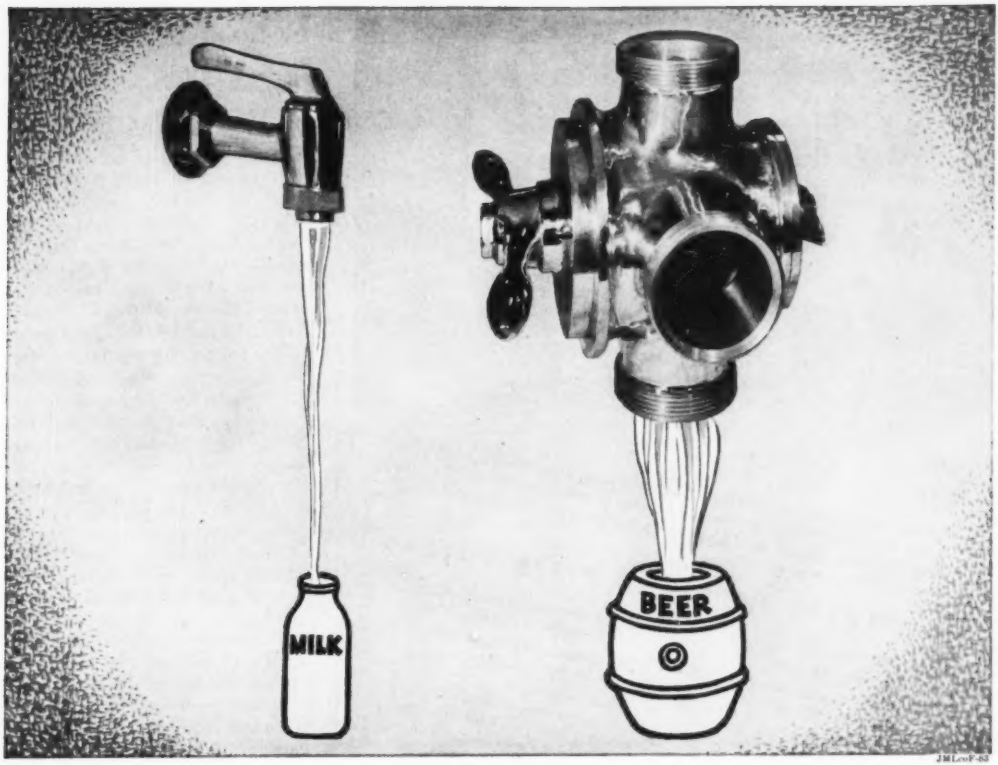
Superior Foundry Co., Cleveland, has added 14,500 sq. ft. of floor space to its plant A. The new addition, part of an extensive program of remodeling and rebuilding of the plant, was constructed around the plant's shop operations without interruption of production.

Hyster Co., Portland, Ore., announces that its individual truck sales and service headquarters in Seattle have been moved to a new location at 753 Ninth Ave. Territory covered by the new store includes northern Idaho, western Montana, and all but five counties of Washington.

Foundries Materials Co., Coldwater, Mich., has purchased a Ryan Navion airplane for the use of its executives, and for rush delivery of vital castings parts to consumers. President Douglas J. Strong, a former Ferry Command pilot, reports that use of the plane has broadened his company's business sphere, and allows him more frequent contact with customers.

Whiting Corp., Harvey, Ill., and Los Angeles, announces the appointment of two new distributors of Trambeam Overhead Crane and Monorail Systems in the East. They are the **George E. Miller Co.**, 24 Brighton Ave., Boston; and **Grays Metal Works, Inc.**, 56th St., and Grays

(Continued on Page 93)



MOO JUICE to MALT JUICE!

The small valve is for the dairy industry: the large one for the brewery field. Both are cast of Federated Nickel Silver . . . for very good reason.

Since 1912 the Specialty Brass Company, Kenosha, Wisconsin, has been making castings for dairy equipment. Then, and even more so now, the demands of this food industry forbid the use of castings with even the slightest blemish. Brewery equipment must likewise be virtually perfect.

To produce such castings consistently . . . and to be famous for it . . . Specialty Brass uses the best in methods, and the *best in materials*. Specialty uses Federated Nickel Silver exclusively.

Nickel silver alloys are particularly suited for use where high corrosion resistance and silvery white color are important. Federated metallurgists can tell you exactly what alloy fits your need. They are ready and willing to help out in your foundry, too, should casting problems arise.

For nickel silvers; brasses and bronzes; aluminum and magnesium alloys; solders; babbitts; fabricated lead products; for any non-ferrous metals, see Federated first.

Federated METALS DIVISION

AMERICAN SMELTING AND REFINING COMPANY, 120 BROADWAY, NEW YORK 5, N. Y.

Prompt shipment—unlimited quantities now available to foundries from BAROID—the world's largest producer of Bentonite. Our modern plants are geared to fulfill every requirement of the foundry trade.

From THESE APPROVED DISTRIBUTORS

American Cyanamid Co.
New York, New York

The Asbury Graphite Mills, Inc.
Asbury, New Jersey

Barada & Page, Inc
Kansas City Missouri (main office)
Also—(Branches)
Tulsa, Okla.
Oklahoma City, Okla.
Wichita, Kansas
Dallas, Texas
Houston, Texas
New Orleans, La.

G. W. Bryant Core Sands, Inc.
McConnellsville, New York

Canadian Industries, Ltd.
Montreal, Quebec, Canada
(all branches)

Casco S. de R. L.
Mexico, D. F.

The Foundries Materials Co.
Coldwater, Michigan
Also Detroit, Michigan

Foundry Service Company
North Birmingham, Alabama

Foundry Supplies Co.
Chicago, Illinois

Thomas H. Gregg Company
Milwaukee, Wisconsin

Independent Foundry Supply Co.
Los Angeles, California

Industrial Foundry Supply Co.
San Francisco, California

Klein-Farris Co., Inc.
Boston, Massachusetts
New York, New York
Hartford, Connecticut

LaGrand Industrial Supply Co.
Portland, Oregon

Marthens Company
Moline, Illinois

Carl F. Miller & Co.
Seattle, Washington

Pennsylvania Foundry Supply & Sand Co.
Philadelphia, Pennsylvania

Robbins & Bohr
Chattanooga, Tennessee

Smith-Sharpe Company
Minneapolis, Minnesota

Southwest Foundry Supply Co.
Houston, Texas

Mr. B. J. Steelman
Chicago, Illinois

Stoller Chemical Co.
Akron, Ohio

Wehenn Abrasive Co.
Chicago, Illinois

Mr. Walter A. Zeis
Webster Groves, Missouri

BAROID
SALES DIVISION
NATIONAL LEAD COMPANY

BENTONITE SALES OFFICE:
RAILWAY EXCHANGE BLDG.
CHICAGO 4 • ILLINOIS

CHAPTER ACTIVITIES

(Continued from Page 78)

Corp., Mishawaka, Ind.; *Vice Chairman*—William Ferrell, Auto Specialties Co., St. Joseph, Mich.; *Secretary-Treasurer*—Paul Jordan, Dodge Mfg. Corp., Mishawaka.

Directors to serve three-year terms: R. D. Craft, Allis-Chalmers Mfg. Co., LaPorte, Ind.; H. D. Hunt, Auto Specialties Co., St. Joseph, Mich.; L. D. Reiff, Superior Steel & Malleable Castings Co., Benton Harbor, Mich.; C. H. Ker, Dalton Foundries, Inc., Warsaw.

Director to serve two-year term: H. T. Lewis, Harbison-Walker Refractories Co., Chicago, Ill.

Directors to serve one-year terms: John Hager, Columbia Castings Co., South Bend, Ind.; Francis Honer, Woodward Pattern Works, Inc., South Bend, Ind.

Past Chairman K. A. Nelson, Chicago Hardware Foundry Co., Elkhart, Ind., will automatically serve as a director for one year.

Following the business session, four separate round-table discussions were held on patternmaking, non-ferrous metals, steel and malleable, and gray iron.

Russell Hoffman, of the Elkhart Pattern Works, Elkhart, Ind., served as chairman of the pattern group. James Strom, Strom Brass Foundry, Elkhart, Ind., led the discussion of the non-ferrous group. Harry Hunt, Auto Specialties Co., St. Joseph, Mich., was the discussion leader of the steel and malleable group and Andrew Peterson, Oliver Corp., South Bend, Ind., headed the gray iron discussion.

With the close of this meeting, activities of the Michiana Chapter are deferred until the Annual Picnic, which will be held late in the summer. Regular meetings will be resumed in October of 1949. In the interim, committees for the coming season will be selected and a program arranged for 1949-50.

Central Illinois Chapter

V. W. Swango
Caterpillar Tractor Co.
Secretary-Treasurer

THE FINAL TECHNICAL MEETING of the 1948-1949 season of the Central Illinois Chapter was held at the Jefferson Hotel, Peoria, Illinois, May 9. A nice turnout listened to an excellent talk by

R. G. McElwee, Vanadium Corp. of America, Detroit, on "*Engineering Properties of Cast Iron.*"

The speaker brought out the characteristics and reactions of additions of various alloys and discussed the engineering properties attained by each, as well as molding problems encountered.

The annual election of officers was held and the following men were elected for 1949-1950:

Chairman, Charles Bucklar, Jr., Superior Foundry Co., East Peoria; *Vice-Chairman*, George W. Schuller, Caterpillar Tractor Co., Peoria; *Secretary-Treasurer*, Robert Dickison, Brass Foundry Co., Peoria.

Elected as Chapter Directors to serve three-year terms were B. W. Branson, Peoria Malleable Castings Co., Peoria, and Henry Cakors, Tazewell Machine Works, Pekin.

A discussion of plans for the Annual Clambake, to be held June 11, concluded the meeting.

Northwestern Pennsylvania

James J. Farina
American Sterilizer Co.
Chapter Reporter

THE APRIL 25 MEETING, held at the Moose Club, Erie, featured as its speaker C. O. Bartlett, C. O. Bartlett & Snow Co., Cleveland.

Mr. Bartlett spoke on the mechanization of foundries, stressing that a primary consideration in foundry mechanization is the allowance of room for efficient operation and maintenance of equipment.

Earl Strick of the Erie Malleable Iron Co., Erie, was asked to substitute for the regular coffee speaker, who was unable to attend. Mr. Strick spoke on the history of the foundry industry in Erie County.

Detroit

Arthur H. Allen
Penton Publishing Co.
Chapter Reporter

OVER 200 FOUNDRYMEN attended the Chapter's First Congress of Foundry Experience on April 6. The Congress, an open forum at which examples of defective castings were presented for analysis by those attending, was directed by Harry Gravlin of the Ford Motor Co., Dearborn, Mich., who has conducted similar discussions at the A.F.S. Michigan and Wisconsin Regional Foundry Conferences this year. Some 30 or 40 of the attending foundrymen gave opinions

THE FOUNDATION of efficient and economical foundry operation is a well-planned "Floor." This allows for supervision, maintenance, order and cleanliness.

A high rate of operations requires both planning and supervision to avoid discouraging delays.

Crucible Melters' Handbook may help you; a handy little volume that is intensely practical. Sent free, of course. Just write for it.

*A battery of gas-fired stationary crucible furnaces at U. S. Naval Gun Factory, Washington, D. C. The pipes manifolded to each set of three furnaces supplies the air at one pound pressure for mixing with natural gas. This untouched and unposed photograph strikingly illustrates the good housekeeping practices observed in this foundry.

Buehler

METALLURGICAL LABORATORY EQUIPMENT

. . . provides the metallurgist with the most complete line of modern designed precision machines for specimen mounting and preparation available anywhere in the world. This finely made equipment has been developed through a thorough understanding of the requirements of the metallurgist and a rigid insistance on perfection in the mechanical design and construction of each item.

Operator using the new Model No. 1506 low speed polisher. Section of laboratory equipped with No. 1251 Duo Belt Sander —No. 1700 Electro Polisher— No. 1315 Press.

1505-2AB Low Speed Polisher

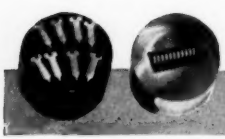
Everything needed for metallurgical testing from cut-off machines, moulding presses, and grinders to the mechanical or electrolytic polishers is included in the Buehler line.

In setting up complete laboratories or adding items to present equipment the metallurgists will find in the Buehler line of coordinated equipment everything needed for producing the best work, with speed and accuracy.

THE BUEHLER LINE OF SPECIMEN PREPARATION EQUIPMENT INCLUDES . . . CUT-OFF MACHINES • SPECIMEN MOUNT PRESSES • POWER GRINDERS • EMERY PAPER GRINDERS • HAND GRINDERS • BELT SURFACERS • MECHANICAL AND ELECTRO POLISHERS • POLISHING CLOTHS • POLISHING ABRASIVES.

Write for bulletin of new equipment or information on any specific item. We invite correspondence relative to setting up complete laboratories suitable for any particular requirement.

Exclusive U. S. agents for Amsler and Chevenard Testing Machines.



Buehler Ltd.

A PARTNERSHIP

METALLURGICAL APPARATUS

165 WEST WACKER DRIVE, CHICAGO 1, ILLINOIS

on the defects under consideration.

A complete transcript of the discussion will be mailed to attending foundrymen by Jess Toth of the Harry W. Dietert Co., Detroit, Congress Committee chairman.

At the May 20 meeting, officers and directors of the Chapter for 1949-50 were elected. They are: *Chairman*—R. J. Wilcox, Michigan Steel Casting Co., Detroit; *Vice-Chairman*—Jess Toth, Harry W. Dietert Co., Detroit; *reelected Secretary*—J. N. Phelps, Vanadium Corp. of America, Detroit; and *Treasurer*—E. J. Passman, Frederic B. Stevens, Inc., Detroit.

Directors elected to serve three year terms are:

Ralph Barker, Wilson Foundry & Machine Co., Detroit; Crary Davis, Aluminum Co. of America, Detroit; Harry Gravlin, Ford Motor Co., Dearborn, Mich.; and Willard E. Kidwell, Packard Motor Car Co.

Northeastern Ohio

R. H. Herrmann
Penton Publishing Co.
Chapter Reporter

OVER 260 FOUNDRYMEN attended the April 14 meeting, held at the Cleveland Club, to hear announcement of winners of the Chapter's Apprentice Contest, announcement of nominations for 1949-50 officers and directors, and to see a motion picture, *"Iron Ore to Motive Power,"* produced by the Ford Motor Co., and a motion picture on the 1948 World's Series.

A.F.S. National Secretary-Treasurer Wm. W. Maloney addressed the group on the 1949 A.F.S. Convention, and cited the various research projects now being sponsored by the Society.

The technical program's motion picture, *"Iron Ore to Motive Power,"* featured a running commentary by Thomas Butler and a summation by Harry Gravlin, both of the Ford Motor Co.

The film showed operations in the blast furnace, coremaking, molding and technical control departments at Ford.

Birmingham District

J. P. McClendon
Stockham Valves & Fittings
Publicity Chairman

A LARGE GROUP of foundrymen heard J. B. Caine, Sawbrook Steel Casting Co., Lockland, Ohio, speak on *"Scabs, Buckles and Spalls"* at

the April 15 meeting, held at the Tutwiler Hotel, Birmingham.

Using slides, Mr. Caine described a simple testing procedure whereby behavior of sand in the cope and sand in contact with molten metal can be correlated and its performance predicted. While Mr. Caine's data dealt with steel foundry practice, he pointed out that the same procedure and technique would apply to gray iron, malleable and non-ferrous casting.

The versatility and simplicity of the test is such as to appeal to the practical foundryman, as well as to the sand engineer. A lively question-and-answer session followed the presentation of Mr. Caine's technical paper.

Chapter Chairman James T. MacKenzie, American Cast Iron Pipe Co., presided at both the dinner and technical session. Nominations were announced for Chapter Officers and Directors for the 1949-50 season.

Mexico City
N. S. Covacevich
La Consolidada, S. A.
Chapter Secretary

HIGHLIGHT of the April meeting was a visit by A.F.S. National President W. B. Wallis. Mr. Wallis addressed the Chapter in English on *"What A.F.S. Is and What It Can Do to Help Chapter 32."* Mr. Wallis' talk was translated into Spanish by N. S. Covacevich, Chapter secretary, for the benefit of the Spanish-speaking membership.

Following this, Chapter President Fernando Gonzalez Vargas, consulting metallurgist, Mexico City, gave a talk on *"The Possibilities of the Acid-Electric Process."*

At a dinner following the regular meeting, the Chapter presented President Wallis with a briefcase in token of appreciation from the Chapter.

Central New York
John A. Feola
Crouse-Hinds Co.
Publicity Chairman

THE MAY MEETING, held May 13 at the Onondaga Hotel, Syracuse, had as its principal speaker Fred G. Sefing, International Nickel Co., New York, A.F.S. National Director-Elect.

In his presentation of *"The Significance of Test Bars in Rela-*

(Continued on Page 92)

OTTAWA SILICA CO. *offers...*

WASHED
DRIED
SCREENED
GRADED
WHITE SANDS

Our specially prepared SILICA SANDS are available in various sizes. We have the particular grade best suited for your requirements. ¶ You will find our SANDS most suitable for cores —they save oil—they are clean, uniform and constant in quality. ¶ SILICA FLOUR, at its best, for foundry uses.

OTTAWA SILICA COMPANY
Ottawa, Illinois

PERSONALITIES

(Continued from Page 73)

Co. Prior to joining Velsicol, Mr. Meisinger was for 11 years research and development chemist for Sherwin Williams.

Donald L. Colwell, sales engineer, Apex Smelting Co., Cleveland, recently returned from a trip to Europe, where he and **Albert Butler** of Denver were sent by the Economic Cooperation Administration to study European aluminum requirements.

R. E. Whittenberg, assistant superintendent of the Bessemer, Ala., Works of the Harbison-Walker Refractories Co., recently succeeded **S. A. Cattlett** as superintendent of the Bessemer Works. Mr. Cattlett has been named district superintendent of the company's Olive Hill, Ky., and Portsmouth, Ohio, plants.

Eads Johnson, Jr., has been appointed assistant vice-president of the Southern Wheel Division of the American Brake Shoe Co. Mr. Johnson, who has been a sales representative of the company's Brake Shoe and Casting Division, attended Kent School and Yale University prior to joining Brake Shoe in 1934.

George H. Bachman, formerly production manager for the Albion Malleable Iron Co., Albion, Mich., has joined the Superior Steel & Malleable Castings Co., Benton Harbor, Mich.

The Magnesium Association, New York, announces the appointment of the following officers for 1949-50: president, **A. W. Winston,** Dow Chemical Co.; vice-president, **H. B. Megill,** Dominion Magnesium, Ltd., Canada; and treasurer, **R. D. Ferguson,** Eclipse-Pioneer Division, Bendix Aviation Corp.

Clarence R. Studer, District sales engineer for the Chain Belt Co., has been appointed to direct that company's new St. Louis office at 8001 Clayton Rd. Simultaneously it was announced that the company's newly-opened Jacksonville, Fla., office at 340 West Church St., will be under the direction of **David B. Hill,** formerly Atlanta district sales engineer.

C. F. Bonnet has been appointed production manager of the Industrial Chemical Division, and **G. W. Russell,** assistant sales manager of the American Cyanamid Co., New York. Mr. Bonnet has been with Cyanamid for more than 15 years and was formerly assistant general sales manager of the Industrial Chemical Division. Mr. Russell, who was formerly manager of the New Products Development department, will take over the sales duties previously handled by Mr. Bonnet.

John Budno has succeeded **Bert Ulehake** as manager of the steel foundry of the Ohio Injector Co., Canton, Ohio.

Lloyd C. Farquhar, Jr., was recently elected vice-president of the East St. Louis Castings Co., East St. Louis, Ill., at a January 25 meeting of the company's Board of Directors in St. Louis.

Dean M. L. Enger of the College of Engineering of the University of Illinois, Urbana, was honored recently at a ceremony at which his portrait was unveiled. The portrait, purchased by his friends, will hang in the Engineering Library. More than 500 of Dean Enger's colleagues, alumni, and students attended the ceremony.

Arthur J. Fausek, president of Modern Engineering Co., St. Louis, was elected president; **C. E. Monlux,** vice-president of the Linde Air Products Co., vice-president; and **E. V. David,** Air Reduction Sales Co., secretary, of the International Acetylene Association at the Association's recent Annual Convention. **Herman Van Fleet** of the Air Reduction Co. was awarded the Association's James Turner Morehead Medal in recognition of his leadership in the development of equipment for use of acetylene and oxygen.

D. J. Beach, since 1934 vice-president of Beach Foundry, Ltd., Ottawa, Ont., recently succeeded to the presidency of the company, following the death of **B. C. Beach,** who founded the Beach Stove Co. in 1894.

Ernest E. Graham, E. E. Graham & Co., Houston, Texas, has been appointed Texas, Oklahoma and Louisiana representative for Cooper Alloy Foundry Co., Hillside, N. J.

IT'S BUCKEYE PROFITABLE, LONGER LASTING CUPOLA BLOCK

Foundrymen know that Buckeye Silica Firestone is the ideal refractory for lining and patching the melting zone of cupolas.

Low in first cost, Buckeye is quickly and easily installed by anyone and has a life from 200% to 400% longer than average.

These are facts that can be substantiated by a trial installation of Buckeye. Why not have our engineers call, at no obligation?

Send for free Bulletin 63

THE CLEVELAND QUARRIES CO.
REFRACTORY DEPT.
1740 E. Twelfth St. CLEVELAND 14, OHIO

BUCKEYE
"FOR THAT EXTRA SERVICE"
SILICA FIRESTONE

The shape's the thing...

The selection of a suitable steel and its subsequent satisfactory performance can be made easy by good design.

How and in what shape a part is made is, we hold, of fundamentally greater importance than of what it is made.

In designing a piece of machinery it is necessary to consider Design, the choice of steel, and its Heat Treatment. All three are highly significant factors, but of them we believe Design to be vital because even the best in steel and treatment will not save a poorly designed part.

To evaluate the importance of good design and its vital relationship to the selection of steel and its heat treatment, we have prepared a book—"Three Keys to Satisfaction". This starts by discussing mainly design factors involved in stress concentrations, and includes useful sketches comparing poor and good features of design from the aspect of subsequent metallurgy. It is available on request to all engineers and designers.

Climax Molybdenum Company

500 Fifth Avenue
New York City

Please send your
FREE BOOKLET
3 KEYS TO SATISFACTION

Name.....
Position.....
Company.....
Address.....

AF6 ● F17

MOLY

Harbison-Walker Refractories Co., Pittsburgh, has announced several changes in its executive and sales staffs. **William F. GodeJohn,** assistant to the president since September, 1948, has been elected vice-president in charge of operations, and **D. L. Kuhner,** superintendent of the Portsmouth, Ohio, works, has been appointed superintendent of the Olive Hill, Ky., works. He will be succeeded by **R. H. Cook** of the Portsmouth Works. **John H. Moore,** superintendent of the company's Louthan Mfg. Co. Division, has joined the headquarters office in Pittsburgh as assistant divisional superintendent. Mr. Moore will be succeeded by **L. F. Sixt,** formerly plant manager for the New Castle Refractories Co., New Castle, Pa.

OBITUARIES

Frank Wolgamott, 49, Pekin, Ill., electrical contractor and a charter member of the A.F.S. Central Illinois Chapter, died April 3. Mr. Wolgamott was assistant maintenance superintendent at Caterpillar Tractor Co., Peoria, Ill., when he resigned to enter contracting work.

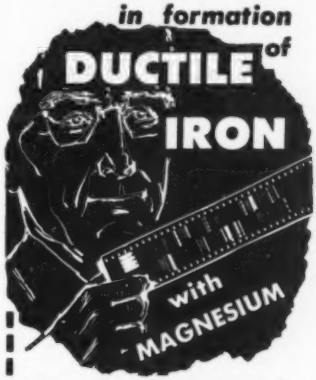
B. C. Beach, 78, founder and president of Beach Foundry, Ltd., Ottawa, Ont., died February 27. Mr. Beach, a pioneer in the cast iron stove business, had a long and varied career as a weekly newspaper publisher, designer, builder and operator of power plants, and foundryman. He founded the company in 1891.

Walter Stansfield, 57, foundry superintendent of the Yonkers, N. Y., Works of the Otis Elevator Co., died April 21. Mr. Stansfield was born in Yorkshire, England, where he served an apprenticeship as a patternmaker. He came to the United States in 1913, and two years later joined Otis as a patternmaker. Mr. Stansfield was for a brief period an instructor at the Charles Schwab Industrial School.

George L. Bolman, 51, partner in the Star Foundry, Houston, Texas, died April 29. A charter member of the Texas Chapter of the American Foundrymen's Society, Mr. Bolman was born in Finley, Ohio, where he served his apprenticeship. He spent most of his life in Toledo, Ohio, where he was employed by the Toledo Malleable Foundry, the Toledo Machine & Tool Co., France Foundry and the National Supply Co. foundry. Mr. Bolman was also employed in foundries in Pennsylvania and Michigan prior to 1936, when he moved to Houston.

William H. Prowse, 64, foundry superintendent for the Cockshutt Plow Co., Brantford, Ont., died April 17. A veteran of the foundry industry, Mr. Prowse was for 25 years employed by the Massey-Harris Co., the Imperial Iron Works and the Hartley Foundry Co., prior to joining Cockshutt. Mr. Prowse had looked forward to attending the 53rd A.F.S. Convention in St. Louis, where he was to receive a 50-year pin. Last month at the Convention, Russell E. Woods, A.F.S. Ontario Chapter chairman, received the 50-year pin on behalf of Mr. Prowse and presented it to his widow upon his return to Brantford.

RESULTS with
SPECTROGRAPHIC
LABORATORY CONTROL
in formation
of
DUCTILE
IRON
with
MAGNESIUM



This recent development for the formation of *NODULAR GRAPHITE* in *IRON* requires *close control* of the *MAGNESIUM CONTENT.*

SPECTROGRAPHIC ANALYSIS is rapid, accurate, and particularly well suited for this *vital* MAGNESIUM *analysis.*

Regardless of your location, Air Parcel Post and Special Delivery bring our facilities into your plant. Your samples are analyzed the *same day* we receive them and *immediately* reported by phone, wire or letter, as you wish. The cost is very modest.

We invite you to write for our *free informative price folder* covering the analysis of metals and non-metals. Merely complete and mail the coupon below.

CHICAGO SPECTRO SERVICE LABORATORY, INC.
2454 West 38th Street
Chicago 32, Illinois

Please send me, without cost or obligation, your Price Information Folder.

Name_____
Firm_____
Street_____
City_____

Quantity
PRODUCTION
of
GREY IRON CASTINGS

ONE OF THE NATION'S
LARGEST AND MOST MODERN
PRODUCTION FOUNDRIES

ESTABLISHED 1866

THE WHELAND COMPANY
FOUNDRY DIVISION

MAIN OFFICE AND MANUFACTURING PLANTS
CHATTANOOGA 2, TENNESSEE

CONVENTION

(Continued from Page 34)

Round table luncheons sponsored by the Gray Iron Division and by the Steel Division were held at noon on May 5. At the gray iron luncheon, H. F. Taylor, Massachusetts Institute of Technology, Cambridge, and N. A. Birch, American Brake Shoe Co., Mahwah, N. J., led a discussion on gating and risering. V. A. Crosby, Climax Molybdenum Co., Detroit and C. O. Burgess, Gray Iron Founders' Society, Cleveland, presided.

Discussion subject at the steel luncheon was *"Sand Testing and Its Relation to Casting Defects."* R. H. Frank, Bonney-Floyd Co., Columbus, Ohio, presided and National Director V. E. Zang, Unitcast Corp., Toledo, Ohio, and F. O. Lemmon, Ohio Steel Foundry Co., Springfield, Ohio, were co-chairmen.

Final steel session of the Convention was held late Thursday afternoon when C. E. Sims, Battelle Memorial Institute, presented *"Effect of Various Deoxidizers on the Structure of Sulphide Inclusions"*, written with H. A. Saller and F. W. Boulger, and J. F. Wallace, Watertown Arsenal, Watertown, Mass., presented *"Effect of Aluminum and Vanadium on the Toughness of Hardenability Cast Steel."* R. E. Kerr, Pettibone Mulliken Corp., Chicago, presided; co-chairman was G. W. Johnson, Vanadium Corporation of America, Chicago.

Mr. Sims reported an evaluation of deoxidizing power of a number of elements and described and illustrated the types of inclusions generally associated with them. He rated aluminum and zirconium about equal as the best deoxidizers.

Mr. Wallace outlined an investigation to compare the effect of aluminum and vanadium, when used as grain refiners, on the toughness of fully quenched and drawn samples from three cast steels of high hardenability.

Last gray iron meeting of the 1949 Convention featured *"Production and Consumption of Heat in the Cupola,"* by D. W. Gunther, National Radiator Co., Johnstown, Pa., and *"Design and Operation of a 10-Inch Cupola,"* by D. E. Krause, Gray Iron Research Institute, Inc., and H. W. Lownie, Jr., Battelle Memorial Institute, both of Columbus, Ohio. W. A. Pennington, Carrier Corp., Syracuse, N. Y., presided and W. W. Levi, Lynchburg Foundry Co., Radford, Va., was co-chairman.

Mr. Gunther explained a number of theoretical calculations relating fuel quality with cupola performance and told how they may serve to measure results being obtained in actual practice. They are expected to provide foundrymen with an indication of the most reasonable steps to be used in improving cupola efficiency.

Mr. Krause gave design details and operating information on a 10-in. cupola in use over three years. Designed to reproduce characteristics of large commercial units as closely as possible, the small cupola has a primary advantage of ease of control and recording of operating variables, he said.

Climaxing the 53rd Annual Convention of the American Foundrymen's Society was the Annual Banquet held the evening of Thursday, May 5. With President W. B. Wallis presiding, A.F.S. Gold Medals and Honorary Life Memberships were presented and the gathering was addressed by the Honorable W. Stuart Symington, Secretary of the Air Force, Washington, D. C.

Brief Notes for Busy Foundrymen

Southern Bentonite FOR NON-FERROUS METAL

Many requests have been made to our company for suggestions in rebonding fine-grained naturally bonded sands. Most non-ferrous shops have learned to use naturally bonded sands and to operate with no more than one or two grades of these sands in the foundry. In course of time, it has been learned that weak sands must be rebonded constantly to furnish satisfactory working properties.

Plants of this nature are usually improperly equipped for continuous mulling of all their sands and so depend upon new sand additions to furnish the necessary green strength for molding.

Panther Creek is one of the best "tools" the non-ferrous shop has at its disposal. Panther Creek may be used without a muller. One of the better ways to build-up a heap of "dead sand" is to scatter Panther Creek very lightly over the entire floor and cut thoroughly. One method is to sprinkle Panther Creek on the top of each mold prior to shake-out. Upon shake-out, Panther Creek easily mixes with the sand and further blending is obtained on subsequent rehandling.

If a small muller is present, it is suggested that a large portion of Panther Creek, from 15% to 30% by weight, be mixed with the base sand for a ten minute period in the muller. This heavily rebonded sand may then be distributed over the weak floor or weak system sand and blended-in by cutting, screening, or turning over by hand.

Panther Creek has greater flowability than any of the well known rebonding agents and it is highly recommended for rebonding non-ferrous grades because the low temperature pouring of non-ferrous metal does not create enough heat to burn-out sands readily and non-ferrous sands must collapse. Panther Creek furnishes the best collapsibility, with the highest green compression strength and greatest flowability.

Write For Free Book
"Economy in the Foundry"
. . . available from your supplier; contains valuable data on the use of Panther Creek Southern Bentonite.

Our New Address: Merchandise Mart Plaza — Chicago 54, Illinois

VOLCLAY Western Bentonite • FIVE STAR Wood Flour • PANTHER CREEK Southern Bentonite

AMERICAN COLLOID COMPANY Chicago Illinois • Producers Since 1927

Available from Leading Foundry Suppliers in the United States and Canada

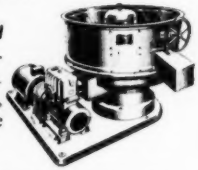
SEMET-SOLVAY FOUNDRY COKE

CONTROLLED—SEMET-SOLVAY'S coke plants are equipped for quality production. Guesswork is eliminated, resulting in constant uniformity in the finished product. That is why, day in and day out, our foundry coke comes up to specifications – the specifications you have demanded.

SEMET-SOLVAY DIVISION
Allied Chemical & Dye Corporation
CINCINNATI • DETROIT • BUFFALO
In Canada: SEMET-SOLVAY COMPANY, LTD., TORONTO

for Better Melting

THE DESIGNERS OF THIS FOUNDRY MACHINERY ARE FOUNDRYMEN THEMSELVES



Sand mixing without grinding or crushing the sand FORDATH "New Type" Sand Mixer. Ensures even distribution of the bonding compound over the sand grains. Time for mixing, 2 minutes; discharging, 30 seconds. Drive, gears and bearings fully protected and lubricated. Five models with capacities from 20 lbs. (9 kg.) to 1 ton.

Multiple core extrusion with tool-room accuracy FORDATH Multiple Rotary Core Machine. Any diameter core from 3.175mm to 152mm, accurate to .025mm. *Machine requires only one conveyor for all sizes of core.* Multiple extrusion from dies up to 66mm diameter, producing 10 of the smallest diameter cores simultaneously. Accurately finished dies, provided with venting device. Two sizes: Senior (power-driven) and Junior (either power-driven or hand-operated for the bench)

Save time and cost, improve quality, reduce rejects with MADE IN ENGLAND

FORDATH MACHINES IN THE FOUNDRY

Used and proved in famous British foundries: Royal Arsenal, Austin Motor Co. Ltd., English Electric Co. Ltd. Ford Motor Co. Ltd. Rolls Royce Ltd., etc., etc.

Full information on request from.
THE FORDATH ENGINEERING CO LTD
Hamblet Works West Bromwich · England
Cables Telegrams: 'METALLICAL' WEST BROMWICH, ENGLAND

CHAPTER ACTIVITIES

(Continued from Page 87)

tion to Casting Properties," Mr. Sefing opened new avenues of thought regarding the types of tests required to guarantee the customer's receiving the most suitable casting for his requirements.

The speaker stressed the fact that foundrymen know their metals better than design engineers, mechanical engineers, production men, etc., and when these men ask for specifications which have no direct bearing on the particular use of the casting to be supplied, it is the foundryman's duty to explain which specifications or tests will give a more direct indication of the properties required of the metal structure of the casting.

By doing this, according to Mr. Sefing, foundries will be better able to satisfy their customers and prove that castings are definitely engineering materials.

The speaker covered the four ways of testing castings; namely, service tests—best but costly in time and money; accelerated service tests —saving of time but correlation of test with service is important; physical tests (non-destructive testing, destructive testing and test bars); and chemical tests.

Using slides, Mr. Sefing showed several methods used in securing sound test bars. He also pointed out that a test specimen machined from the casting itself would give a truer picture of the metal structure than a separately cast test bar.

The speaker also covered the various properties desired in casting, such as strength, machineability, hardness, wear resistance, soundness or pressure tightness, modulus of elasticity and suggested tests to prove the degree of each in various types of metal structures.

In closing, Mr. Sefing showed slides of various types of castings giving the design properties required, and specifications which would be a guarantee that these properties were present in the metal casting.

This was the last regular meeting of the Central New York Chapter for the season, excepting the Chapter's Annual Picnic, held this year at Mountain Top Grove, near Binghamton, June 10.

FIRM FACTS

(Continued from Page 82)

Ave., Philadelphia. Simultaneously it was announced that the James J. Burke Co., 405 Kearns Bldg., Salt Lake City, has been appointed Whiting representative in the Salt Lake City area.

Wilson & Geo. Meyer & Co., Los Angeles, announces the removal of its headquarters to 4800 District Blvd., Los Angeles 11.

Two new exclusive representatives have been appointed by the **Hydro-Line Mfg. Co.** to handle sales of its line of hydraulic cylinders and special machinery. **Leaser Engineering Co.,** LaPorte, Ind., will represent the company in Northern Indiana and the south side of Chicago; and the **Euclid Machine & Sales Co.,** 1836 Euclid Ave., Cleveland, will carry Hydro-Line products in Northern Ohio.

B & S Bronze Foundry, Inc., announces the removal of its plant and office to a new location as 76 Sedgwick St., Brooklyn, 2, N. Y. Telephone: Main 4-6634.

J. E. Baker Co., York, Pa., originator of the dead burning of dolomite process for maintenance in open hearth basic steel furnaces, is this year celebrating its 60th Anniversary.

Christopher Williams & Co., Inc., newly-formed engineering firm has established offices at 923 Penn Ave., Pittsburgh. The company will handle special conveyor and materials handling equipment and will act as manufacturers' representatives, in addition to designing and building rolling mill equipment.

Foundry Jobs Available Says Government Report

FOUNDRIES WILL PROVIDE a large number of jobs for new workers during the next several years according to a handbook just published for the Veterans Administration. Prepared by the Bureau of Labor Statistics, the 454-page illustrated *Occupational Outlook Handbook* contains complete reports on 288 occupations.

The report on each occupation describes the job and gives data on the chances for employment, training and qualifications required, earnings and working conditions. The handbooks are available to the public, at $1.75, from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

In addition to foundry occupations, the following are among those reported to offer good employment opportunities for the next few years: physicians, teachers, librarians, secretaries and stenographers, automobile mechanics, meat cutters, bakers, and glass mold makers.

"OLIVER"
TILTING DOUBLE ARBOR
Saw Bench

- Table always remains horizontal
- Saw tilts up to 45 degrees
- Either Rip or Cross-cut Saw instantly available
- Self-Contained Dust Chute
- Automatic Electrical Brake
- Precision Ball Bearings

Invaluable in every pattern shop . . .
Write for Bulletin No. 260-D

OLIVER MACHINERY COMPANY
Grand Rapids 2, Michigan

HIGH SILICON IRON
JISCO
SILVERY
The choice of Foundries who demand the best.
"Jisco" Silvery is a "must" in the modern foundry. Its use means better castings at lower cost. It supplies the needed silicon.

Full information upon request.

- VIRGIN ORES
- LADLE MIXED
- MACHINE CAST

THE **JACKSON IRON & STEEL CO.**
JACKSON, OHIO

RELIABLE
FOUNDRY
REFRACTORIES

- LADLE LINERS
- TAP HOLE BRICK
- SLAG HOLE BRICK
- LADLE SOLID BOTTOMS
- PLASTIC REFRACTORIES
- FOUNDRY FIRE CLAY
- CUPOLA BLOCK MORTAR

The Pyro Refractories Co.
Oak Hill, Ohio **20 N. Wacker, Chicago 6, Ill.**

FERRO-SILICON BRIQUETTES

Tepco Ferro-Silicon Briquettes, used mainly for the addition of silicon to the cupola charge of iron foundries, are most convenient because they contain a certain definite weight and can be counted instead of weighed. At the same time, the briquettes are more valuable than lump ferro-silicon because the binder in the briquettes protects the ferro-silicon as it is melted in the cupola and a greater return of silicon is obtained by that means.

Tepco Ferro-Silicon Briquettes are produced at our Chattanooga plant (formerly Southern Ferro-Alloys Company, Chattanooga, Tennessee). The 2½-pound briquettes contain one pound of silicon and the 5-pound briquettes contain two pounds of silicon.

Tepco Ferro-Silicon is also available in all sizes from lump through 150 mesh by down, packaged or in bulk—50%, 65% and 75% standard and low impurity grades. Special grades and sizes quoted on request.

PIG IRON

Tepco's high-grade pig iron includes two preferred types:

Diamond D Pig Iron—low-phosphorous, low-silicon, high-carbon, machine cast—produced at our Wrigley Charcoal Plant at Wrigley, Tennessee.

Rockwood Pig Iron—malleable and foundry, machine cast, produced at our Rockwood, Tennessee, plant.

FOUNDRY COKE

Chattanooga By-Product Foundry Coke—produced from properly blended coals to furnish high-grade foundry coke. Widely used by foundries in the Southern area. Chattanooga coke also available in smaller sizes.

We will be glad to discuss with you, at any time, the numerous advantages of our plants and products.

TENNESSEE PRODUCTS & CHEMICAL CORPORATION

GENERAL OFFICES: NASHVILLE, TENNESSEE

PLANTS AT CHATTANOOGA, ROCKWOOD AND WRIGLEY, TENN.

Represented by

MILLER & CO., Chicago, St. Louis, Cincinnati; S. H. BELL CO., Pittsburgh; T. H. BENNERS & CO., Birmingham

EXPORT AGENTS: ORE & FERRO CORPORATION, 30 Broad St., New York

Index to Advertisers

Ajax Metal Co. 14
Alter Co. 80
American Colloid Co. . . . 91
Baroid Sales Div., National Lead Co. . . . 84
Beardsley & Piper Co. . . . 8-9
Buehler Ltd. 86
Chicago Spectro Service Laboratory, Inc. 89
Cleveland Flux Co. 7
Cleveland Quarries Co. . . . 88
Climax Molybdenum Co. . . 89
Crucible Manufacturers' Ass'n. 85
Dayton Oil Co. 95
Delta Oil Products Co. . . . 6
Eastman Kodak Co. 79
Electro Metallurgical Co. . . 16
Federal Foundry Supply Co. . 1
Federated Metals Div., American Smelting & Refining Co. 83
Fordath Engineering Co., Ltd. 92
Globe Iron Co. 4
Industrial Equipment Co. . . 95
International Nickel Co. . . 11
Jackson Iron & Steel Co. . . 93
Keokuk Electro-Metals Co. . 20
Kirk & Blum Mfg. Co. . . . 10
Krause, Chas. A., Milling Co. 15
Modern Equipment Co. . . . . Back Cover
National Engineering Co. . . 22
Oliver Machinery Co. . . . 93
Ottawa Silica Co. 87
Pittsburgh Lectromelt Furnace Corp. . . Inside Front Cover
Pyro Refractories Co. . . . 93
Schneible, Claude B., Co. . . 21
Scientific Cast Products Corp. 95
Semet-Solvay Div., Allied Chemical & Dye Corp. 92
Smith, Werner G., Co. . . . . Inside Back Cover
Standard Horse Nail Corp. . 81
Stevens, Frederic B., Inc. . . 17
Taimms Silica Co. 81
Tennessee Products & Chemical Corp. 94
Tousey Varnish Co. 2
Union Carbide & Carbon Corp. 16
United Compound Co. . . . 80
U. S. Graphite Co. 12-13
U. S. Hoffman Machinery Corp. 95
U. S. Rubber Co. 5
Universal Engineering Co. . . 19
Wheland Co. 90

A.F.S. Publications

Development of the Metal Casting Industry 18
Recommended Practices for the Sand Casting of Non-Ferrous Alloys 80

You are invited to TEST the Uniform Quality of DAYTON CORE OIL

"Ask the men who use it."

Prove by use-test what hundreds of foundries know . . . that you get better cores at lower cost, and cleaner, more uniform castings, with Dayton Core Oil. Order a drum for a use-test. Ask our representative to help you solve your core production problems.

THE DAYTON OIL COMPANY
DAYTON, OHIO

Makers of DOCO BINDER & CORE PASTE • DOCO STEEL CORE & MOLD WASH

LADLES

LADLES • BOWLS • SHANKS • SPECIAL EQUIPMENT • TONGS • BAILS

• ALL CAPACITIES
• ALL TYPES *Including*
TIMKEN WORM GEARED LADLES

Coming . . . the new "DISTRIBUTOR"
Watch for it

Industrial EQUIPMENT COMPANY
115 N. OHIO ST. • MINSTER 1, OHIO

SCIENTIFIC Pressure Cast MATCH PLATES

1. The finest quality Matchplates ever produced in our history!
2. Fast delivery of ordinary plates in from 4 to 6 days!
3. At prices only *slightly* higher than 12 years ago!

The SCIENTIFIC CAST PRODUCTS Corp.
1388-1392 EAST 40th STREET
CLEVELAND 3, OHIO
2520 WEST LAKE STREET
CHICAGO 12, ILLINOIS

Memo:
Modernize for *Lower Costs* with HOFFMAN

Heavy Duty Vacuum Cleaning...

Yes, you cut your production costs as well as your maintenance costs. Dust removed from overhead structure, walls, floors and storage areas thoroughly, efficiently during normal operations. Saves re-painting. Faster, better cleaning of moulds and cores for better castings at lower unit cost. Salvage steel grit or shot – saves time and manpower. Check the heavy duty models for your foundry *now*.

Write for Literature and a FREE SURVEY now!

AIR APPLIANCE DIVISION
U.S. HOFFMAN MACHINERY CORPORATION
99 FOURTH AVENUE, NEW YORK 3, N. Y.
CANADIAN PLANT: CANADIAN HOFFMAN MACHINERY CO. LTD. NEWMARKET, ONT.

BOOKS

PUBLICATIONS TO MEET THE CURRENT NEEDS OF THE FOUNDRY INDUSTRY

		AFS MEMBER PRICES	NON MEMBER PRICES
1.	Alloy Cast Irons Handbook (2nd Edition)	$2.25	$ 4.50
2.	Aluminum Process Control (SAE)	1.00	2.50
3.	Analysis of Casting Defects	2.50	4.25
4.	Cast Metals Handbook (3rd Edition)	6.50	7.50
5.	Centrifugal Casting	2.00	3.75
6.	Classification of Foundry Cost Factors	1.00	2.00
7.	Cupola Operations Handbook	6.00	10.00
8.	Development of the Metal Castings Industry	5.00	8.50
9.	Foundry Cost Methods	1.50	3.00
10.	Foundry Dust Control	1.00	2.00
11.	Foundry Process Control, Ferrous (SAE)	1.50	2.50
12.	Foundry Sand Testing Handbook (5th Edition)	2.25	4.00
13.	Gating and Heading Malleable Iron Castings	1.50	2.50
14.	Gating Terminology Chart	.25	.25
15.	Graphitization of White Cast Iron	.10	4.00
16.	Malleable Foundry Sand and Core Practice	2.25	3.25
17.	Malleable Iron Melting	2.00	4.00
18.	Permanent Mold Castings Bibliography	2.25	3.00
19.	Recommended Good Practice Code and Handbook on the Fundamentals of Design, Construction, Operation and Maintenance of Exhaust Systems	1.50	3.00
20.	Recommended Good Practices for Metal Cleaning Sanitation	3.00	2.25
21.	Recommended Good Safety Practices for the Protection of Workers in Foundries	1.25	2.25
22.	Recommended Practices for Grinding, Polishing and Buffing Equipment Sanitation	1.25	.60
23.	Recommended Practices for Industrial Housekeeping and Sanitation	.40	2.00
24.	Recommended Practices for Sand Casting Aluminum and Magnesium Alloys	1.00	1.75
25.	Recommended Practices for Sand Casting of Non-Ferrous Alloys (1st Edition)	1.00	4.00
26.	Tentative Code of Recommended Practices for Testing and Measuring Air Flow	2.25	
27.	AFS "Transactions" Vol. 51 (Clothbound)	1.00	2.00
	AFS "Transactions" Vols. 53, 54, 55 (Clothbound)	3.00	15.00
28.	AFS "Transactions" Vol. 56 (Clothbound)	4.00	15.00
29.	AFS Apprentice Training Standards for the Foundry Industry	7.00	15.00
		1.00	2.00

Every AFS publication is basic data, reflecting actual practice in industry. Each book is written for the practical foundryman who wants authoritative information on approved techniques and materials, with down-to-earth application to practical production problems.

Check the list of "How-to-Do-It" books to be sure that you have a complete library for ready reference.

AMERICAN FOUNDRYMEN'S SOCIETY
222 WEST ADAMS ST.
CHICAGO 6, ILLINOIS

Please send the books circled below. $_____ remittance enclosed.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 (Vol. 51, Vol. 53, Vol. 54, Vol. 55) 28 29

Name

Address

City Zone State

Company

AFS pays postage when remittance accompanies order.

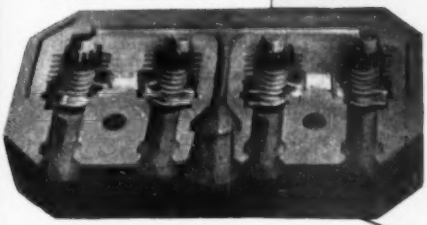
TUB CASTING ASSEMBLY LINE . . . 250 tub molds are set up every hour. Note the amount of green sand core supported by the LINOIL-bonded crown core.

THE MAYTAG "MASTER" WASHER

LINOIL CORES FOR THIRTY YEARS

THE MAYTAG COMPANY Newton, Iowa

CROWN CORE FOR THE TUB CASTING



CORES FOR THE IRON FOUNDRY . . . core-mold for the "Multi-Motor" gasoline engine and power housing.

Maytag's two foundries (one aluminum and the other gray iron) have cast parts for more than 5½ million Maytag washers — and for the past thirty years, LINOIL has cored these castings.

Soft, collapsible cores for aluminum tubs . . . or hard, accurate, and smooth-surfaced core molds for air-cooled cylinders . . . LINOIL does both jobs dependably, economically, and with an unvarying performance, drum after drum, shipment after shipment.

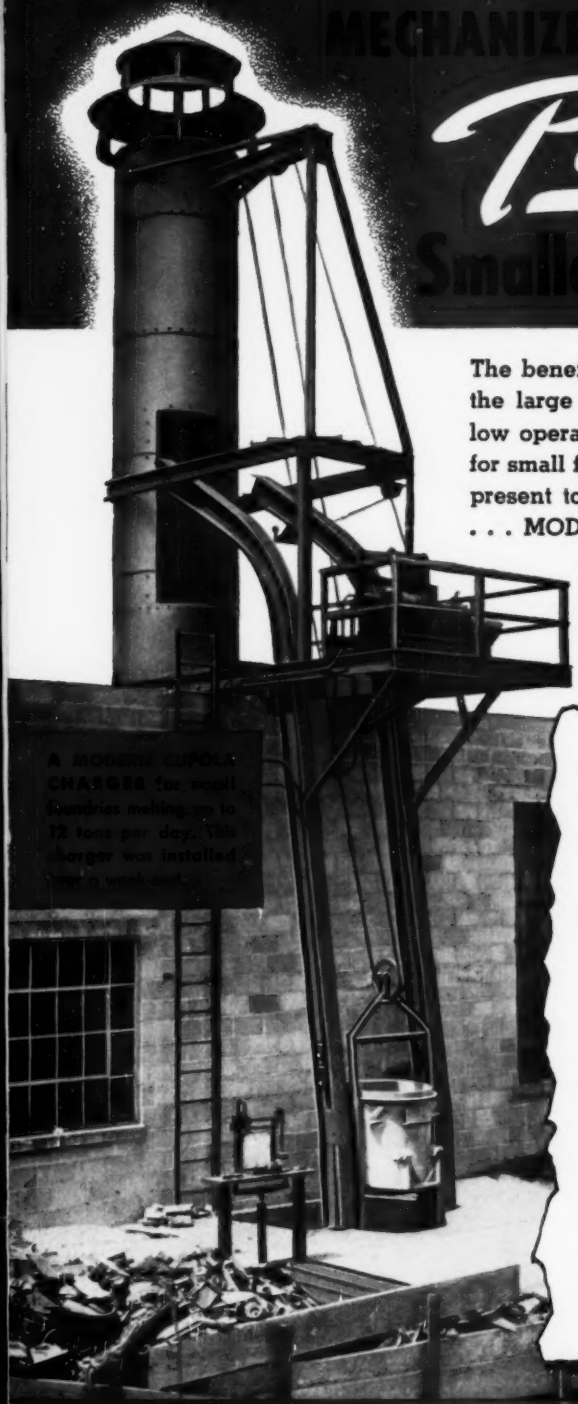
LINOIL
THE LOGICAL OIL

THE WARNER G. SMITH COMPANY

(DIVISION OF ARCHER-DANIELS-MIDLAND COMPANY)

2191 WEST 110th STREET · CLEVELAND 2, OHIO

MECHANIZED CUPOLA CHARGING *Pays Off* for Smaller Foundries Too!



A MODERN CUPOLA CHARGER for small foundries melting up to 12 tons per day. This charger was installed [illegible]

The benefits of mechanical charging are *not* confined to the large foundry. Moderate cost, easy installation and low operating expense make MODERN Cupola Chargers for small foundries a profitable investment. Whether your present tonnage is ten tons per day or several hundred . . . MODERN EQUIPMENT CO. engineers can provide you with a Mechanized Charging System which will help you realize maximum benefits from present plant facilities, with less manpower. Write for Catalog 147-A.

CONSULT THE MODERN EQUIPMENT CO. REPRESENTATIVE IN YOUR AREA . . .

BIRMINGHAM, ALA.
McVOY HAUSMAN COMPANY
2024 Sixth Avenue, North

BUFFALO 14, N. Y.
M. L. DOELMAN
66 Russell Avenue

CHATTANOOGA, TENN.
ROBBINS & BOHR
535 Chattanooga Bank Bldg.

CHICAGO 5, ILL.
MAYER & OSWALD, INC.
37 West Van Buren Street

CINCINNATI 6, OHIO
HENRY M. WOOD COMPANY
920 E. McMillan Street

CLEVELAND, OHIO
RUSSELL F. LINCOLN COMPANY
1058 Mapleciffe Drive
(Lakewood, Ohio)

DENVER 3, COLO.
GEORGE E. TARBOX
439 Williams Street

DETROIT 8, MICH.
W. W. DRISSEN
2055 W. Grand Blvd.

HOUSTON, TEX.
McARDLE EQUIPMENT CO.
5724 Navigation Boulevard

LOS ANGELES 11, CALIF.
CHAMBERLAIN COMPANY
4700 District Blvd.

MILWAUKEE 13, WIS.
RISNEY FOUNDRY EQUIP. CO.
1307 North 63rd Street

PATERSON 1, N. J.
TELLER EQUIPMENT CO.
56 Hamilton Street

PHILADELPHIA 2, PA.
S. R. VANDERBECK
731 Commercial Trust Bldg.

PITTSBURGH, PA.
W. C. EDGAR
Oliver Building

PORTLAND 9, OREGON
GAMBLE-HAWKINS COMPANY
1617 N. W. 14th Street

PROVIDENCE, R. I.
WHITEHEAD BROTHERS CO.
17 Exchange Place

ST. LOUIS, MO.
SHEA-BROWNELL COMPANY
3903 Olive Street

SAN FRANCISCO 3, CALIF.
E. A. WILCOX COMPANY
277 Seventh Street

SEATTLE, WASH.
F. T. CROWE & CO., INC.
218 Walker Building

CANADA:

MONTREAL, QUEBEC
CANADIAN FOUNDRY SUPPLIES & EQUIP., LIMITED
4295 Richelieu Street

TORONTO 2, ONTARIO
CANADIAN FOUNDRY SUPPLIES & EQUIP., LIMITED
49 Main St., Mimico

EXPORT OFFICE:

NEW YORK 5, N. Y.
RENE K. PRICE & ASSOC. INC.
70 Pine Street

MODERN EQUIPMENT CO.

[illegible], WISCONSIN

CUPOLAS • CUPOLA CHARGERS • LADLES OF ALL TYPES • POURING DEVICES • METAL POURING SYSTEMS • CRANE AND MONORAIL SYSTEMS • ELECTRIC CRANES